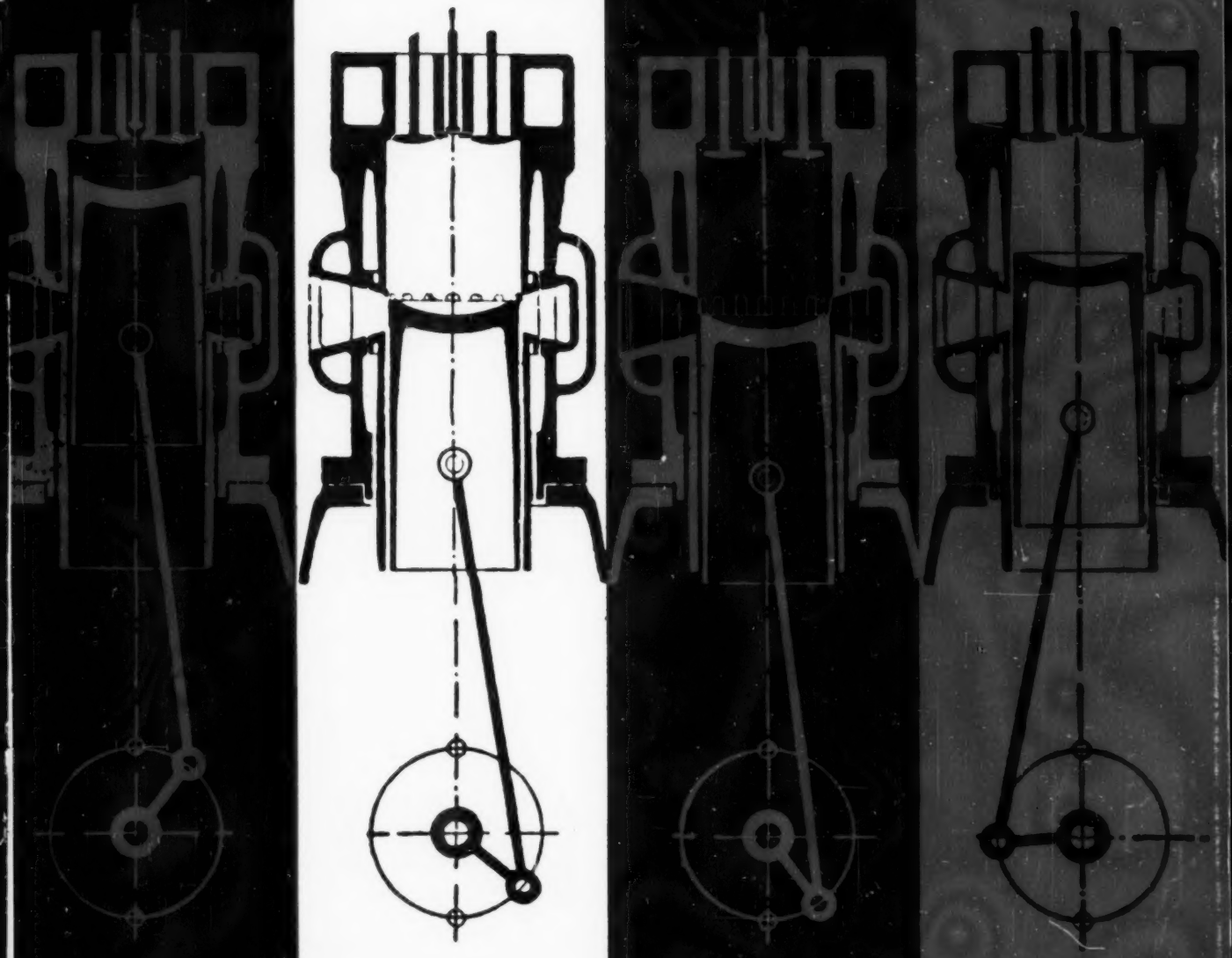
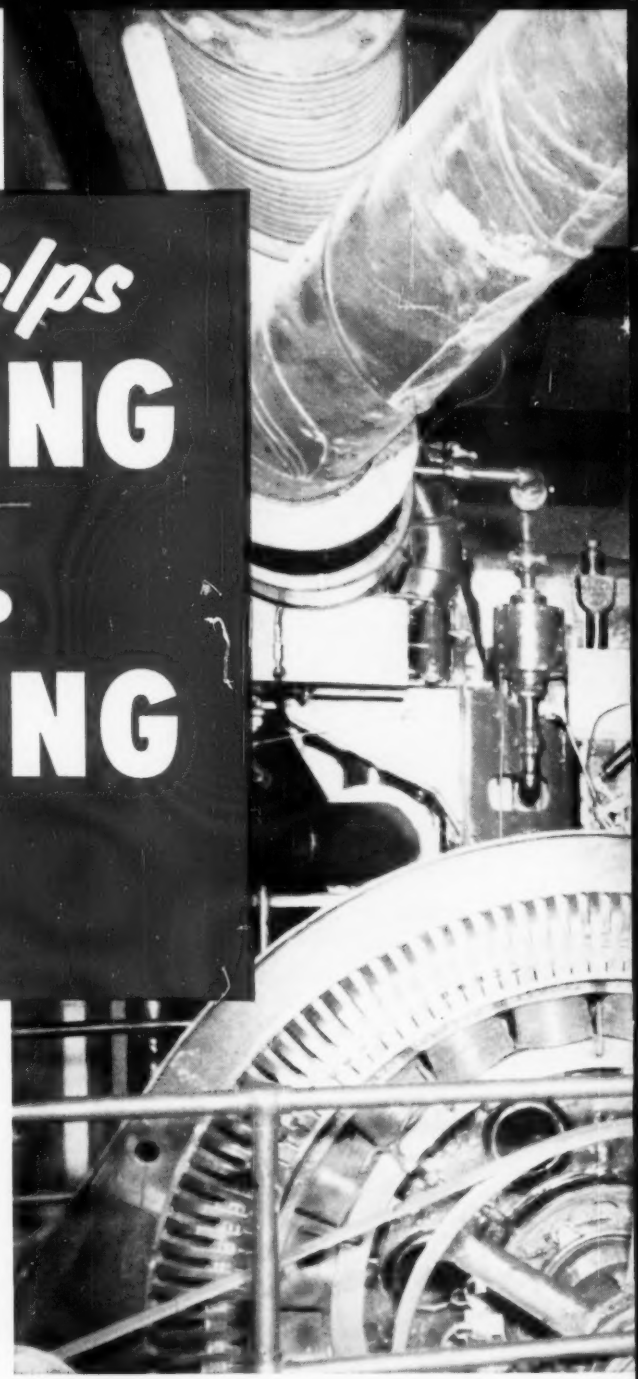
diesel power

DECEMBER 1954



How Texaco helps
CUT BEARING WEAR... EXTEND RING LIFE...



LEBANON, OHIO, Municipal Power Plant has been using one of the famous *Texaco Ursa Oils* in its two straight diesel engines since 1948 — with excellent results. When two supercharged Worthington dual-fuel engines were installed in April, 1951, Texaco was naturally the choice for lubrication.

With Texaco's help, this plant has enjoyed substantial savings for more than six years. Bearing wear is notably low and ring life exceptional. In fact, recent overhaul showed rings in such fine shape that they could be put right back for re-use. Engines are running clean, lube oil consumption and maintenance expense are minimum.

Benefits like these explain why —

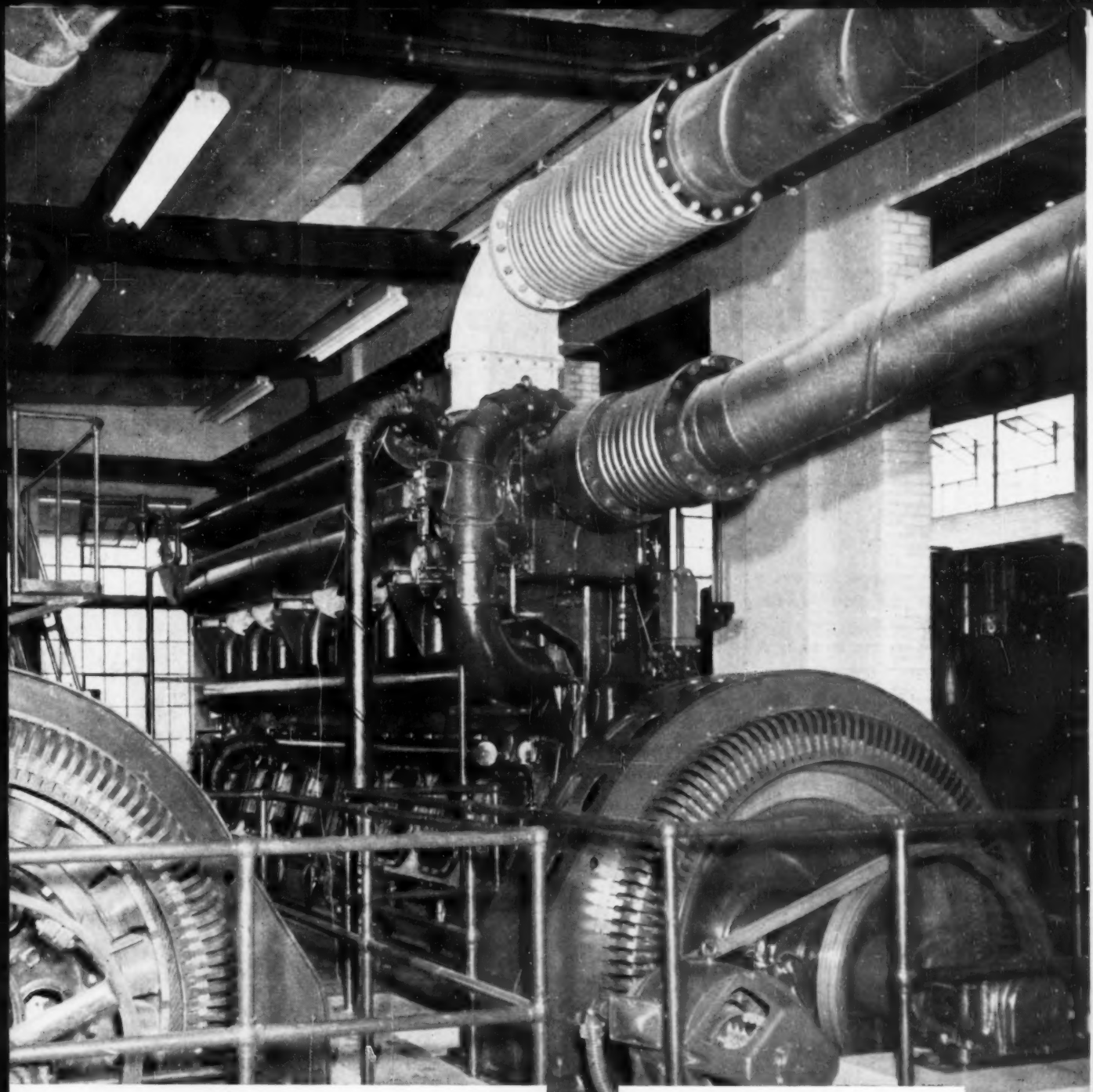
For over 20 years, more stationary diesel horsepower in the U.S. has been lubricated with Texaco than with any other brand.

You can enjoy similar benefits by lubricating with one of the famous *Texaco Ursa Oil* series—a complete line of lubricating oils especially refined to make diesel, gas and dual-fuel engines deliver *more power*

TUNE IN:
TEXACO STAR THEATER
starring JIMMY DURANTE
or DONALD O'CONNOR,
on TV Saturday nights.
METROPOLITAN OPERA
radio broadcasts
Saturday afternoons.

TEXACO

TEXACO



with *less fuel* over *longer periods* between overhauls.

A Texaco Lubrication Engineer will gladly help you make the proper selection. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TWO 8-cylinder, supercharged Worthington dual-fuel engines in Lebanon, Ohio, Municipal Power Plant. Each has 16-in. bore and 20-in. stroke, is rated at 1,760 h.p. at 360 r.p.m. Each drives a 1,245 k.w. generator and is lubricated with Texaco.

URSA OILS

FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

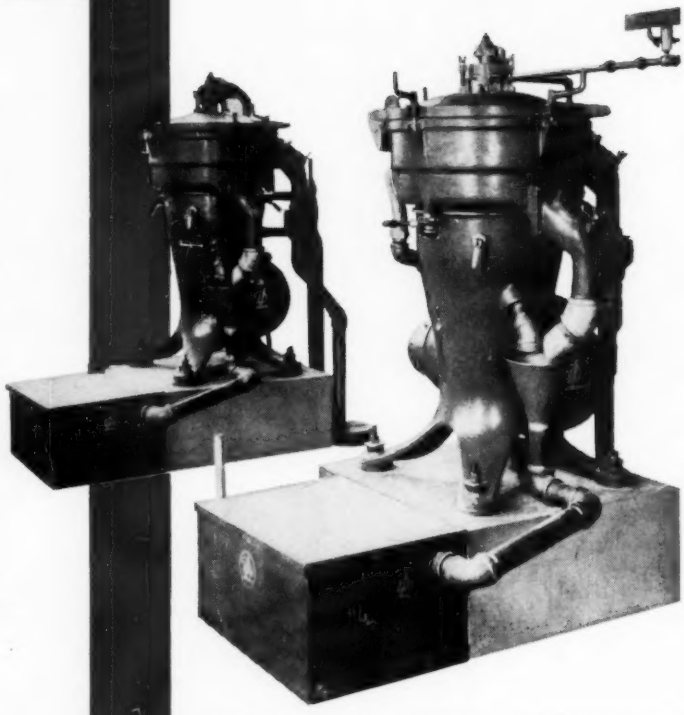
WHY MORE DIESELS ARE RUN ON RESIDUALS PURIFIED BY DE LAVAL

The main reason is cost-cutting . . . considerable savings in your plant. Because heavy fuels are much cheaper than light distillates . . . and most diesel engines can be easily converted to burn these residuals, give you a sizeable economy.

De Laval Purifiers take all the problems out of purification — they prepare the fuel properly . . . remove the maximum of incombustible solids and ash at *constant operating speed and efficiency.*

If the oil can be pumped, De Laval can purify it! Right now, De Laval Purifiers are handling oils having viscosities between 5000 and 6000 SSU at 100° F — in plants from coast-to-coast. Oils of greater specific gravity than water are also being purified.

Write for all the details . . . today. Your plant profits can be increased with De Laval Heavy Fuel Purifiers! . . .



TYPICAL PURIFYING RESULTS

	Unpurified Oil	Purified Oil
Specific gravity at 60°/60° F.	0.968	0.968
Viscosity SSU at 100° F.	5000	5000
Viscosity SSF at 122° F.	225	224
BS&W per cent by volume	0.60	0.20
Water by distillation, per cent by wt.	0.04	Trace
Ash at 550° C., per cent by wt.	0.045	0.021
Sediment by hot extraction	0.063	0.008

DE LAVAL
heavy oil purifiers

THE DE LAVAL SEPARATOR COMPANY Poughkeepsie, New York • 427 Randolph St., Chicago 6 • **DE LAVAL PACIFIC CO.** 61 Beale St., San Francisco 5

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diesel power

Established in 1923 Vol. 32, No. 12 December, 1954

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Diesel Publications, Inc., 192 Lexington Avenue, New York 16, N. Y.

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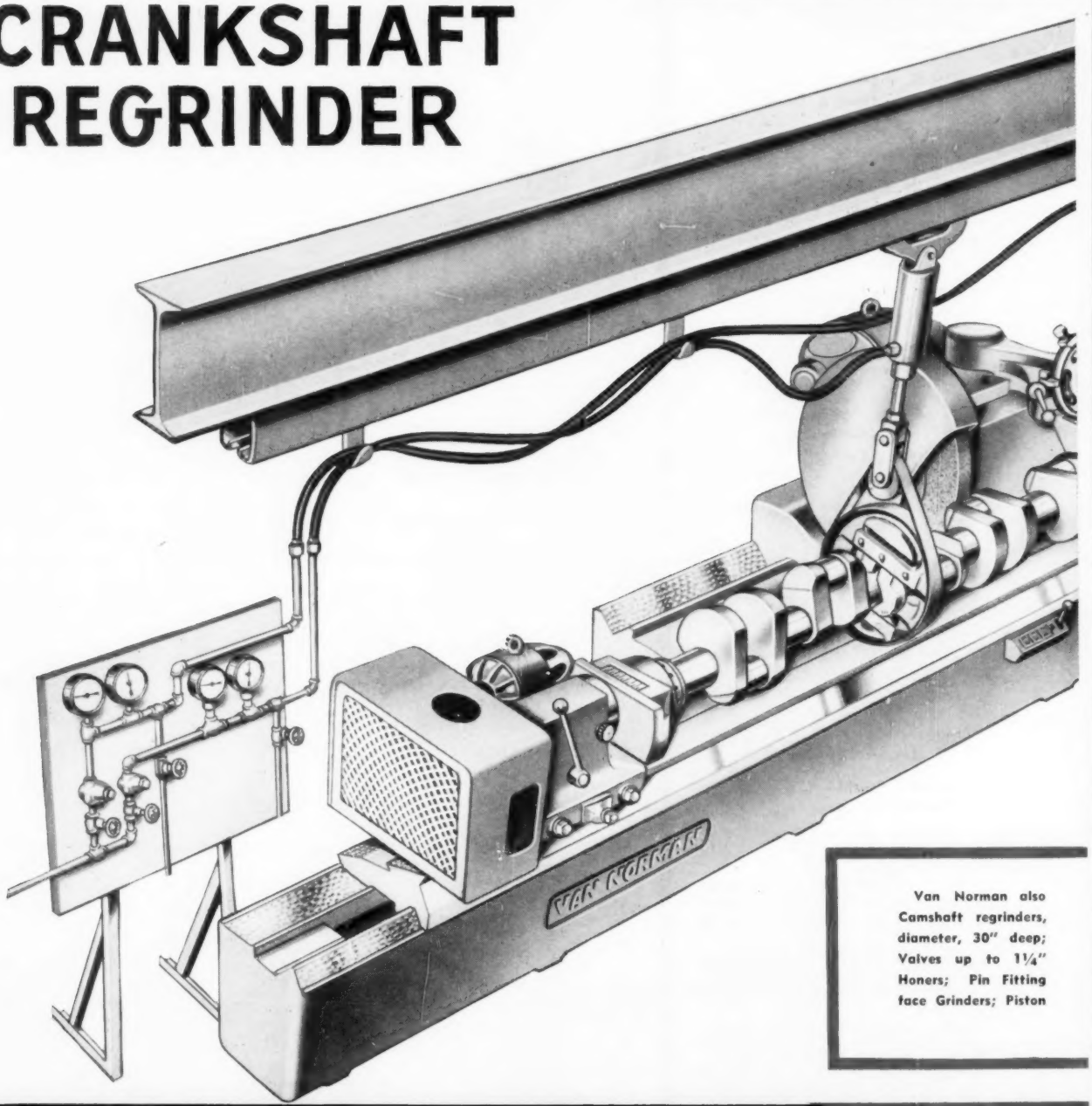
NEW!

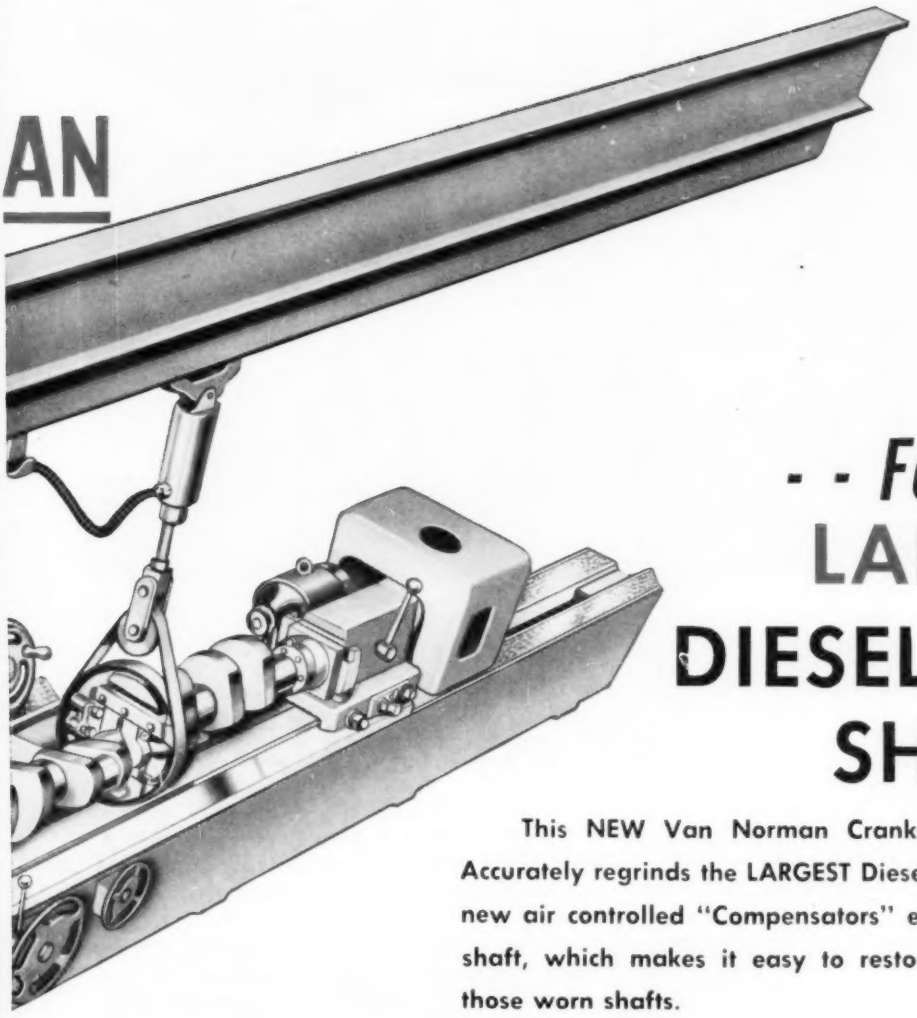
REVOLUTIONARY VAN NORM CRANKSHAFT REGRINDER



Van Norman also Camshaft regrinders, diameter, 30" deep; Valves up to 1¼" Honers; Pin Fitting face Grinders; Piston

Quality is the reason that's why

AN



- - For the
LARGEST
DIESEL ENGINE
SHAFTS

This NEW Van Norman Crankshaft Regrinder Quickly and Accurately regrinds the LARGEST Diesel Crankshafts. Van Norman's new air controlled "Compensators" eliminate sag and support the shaft, which makes it easy to restore new shaft performance to those worn shafts.

The NEW Van Norman Diesel Engine Crankshaft Regrinder is equipped with double end drive, outboard counterweights and 54" Wheel. It is easy to operate and is built for long life and accuracy. Van Norman builds a Crankshaft Regrinder for every size requirement. The machine shown is the No. 111ELW-42" X 180" for shafts up to 180" long.

builds for the Diesel Shop:
Cylinder Boring Bars up to 9" in
Valve Refacers, Heavy Duty for
stem diameter; Automatic Wet
Equipment; Automatic Wet Sur-
Grinders.

Write VAN NORMAN COMPANY

Springfield (7), Massachusetts
for complete information.

"It Pays to Van Normanize"

Model 145 Dart Truck equipped with Allison TORQMATIC DRIVE being loaded at Sunnyhill Coal Company's New Lexington, Ohio, mine. Truck is one of 10 operated by Sunnyhill.

10 trucks replace 30 – cut costs 62%

WHEN 10 50-ton trucks equipped with Allison TORQMATIC DRIVES replaced 30 mechanical-drive 20- and 30-ton trucks at Sunnyhill Coal Company's New Lexington mine:

Operating costs dropped *18.6¢ per ton,*

Maintenance costs were cut *13.1¢ per ton,*

And the TORQMATIC-*equipped trucks now haul 32.6* more *tons per truck hour.*

But lower costs are only part of the story.

On-the-job accidents have dropped sharply. Drivers stay fresher, more alert because they now have no clutch pedal to push – quick-shift at full throttle with finger-tip hydraulic control—have only 3 shifts instead of 7 or 10.

Wet weather worries have almost disappeared—road maintenance costs are lower. Smooth power transmission by the Allison TORQMATIC DRIVES lets trucks drive through mud and muck—conditions that often shut down the mine before TORQMATIC-equipped units came on the job.

Big reason for lower operating and maintenance costs is shock-free power transmission by the *matched* TORQMATIC Converter-Transmission teams. The Converter absorbs shock loads instead of transmitting them along the drive line—protects engine, differential, drive shaft and transmission from damage.

There's an Allison TORQMATIC DRIVE for your 40- to 400-horsepower gasoline and Diesel equipment. New low-cost 40-150 h.p. TORQMATIC Converters easily fit present equipment, are completely self-contained for simple installation. Get full details about Allison TORQMATIC DRIVES from your equipment manufacturer or dealer or write:

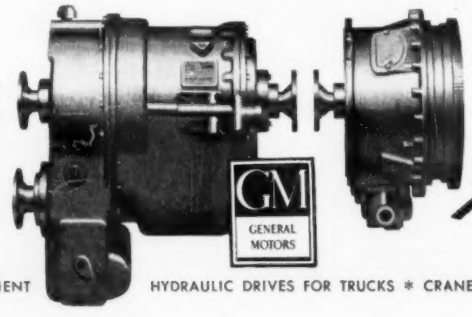
Allison Division of General Motors
Box 894S, Indianapolis 6, Indiana

ALLISON TORQMATIC DRIVES

Unbeatable Team for Maximum Operating Economy

- **Quick-Shifts** at full throttle with finger-tip hydraulic control
- **Holds** power to load at all times – no clutch pedal to push—no gearshift guess
- **Reduces** maintenance costs by absorbing shock – eliminates engine lugging – prolongs equipment life
- **First** torque converter-transmission team designed to work as a *unit* and built by one manufacturer
- **Cuts** driver training costs

FIRST MATCHED UNITS BUILT BY ONE MANUFACTURER

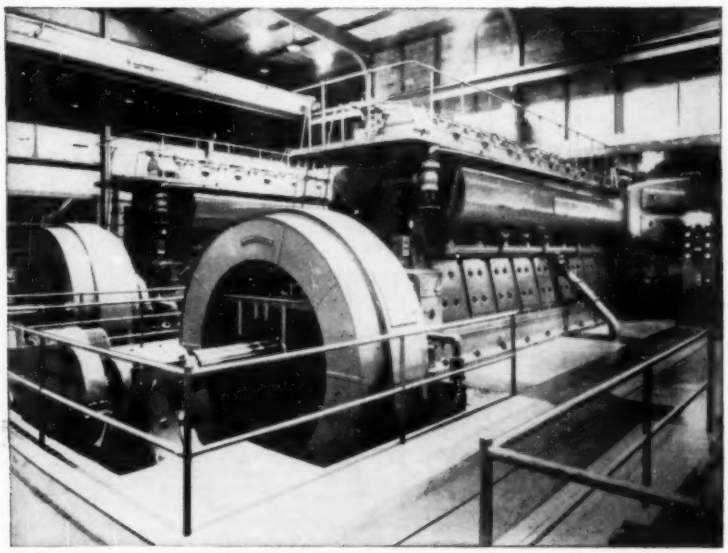


Allison
TORQMATIC DRIVES

COMPACT, EFFICIENT HYDRAULIC DRIVES FOR TRUCKS * CRANES * TRACTORS * SCRAPERS * SHOVELS * DRILLING RIGS

HOW DOES YOUR DIESEL OPERATION COMPARE WITH THESE TWO?

2 YEARS OLD! . . . 16,280 HOURS! . . . NO REPAIRS! During two years of grueling work, mining 203,000 tons of coal from a 36″ seam with an average overburden of 35 feet hard pan shale, this Marion 111 M shovel never required repairs . . . never increased its oil consumption!



LARGEST REA PLANT IN KANSAS REPORTS DC-840 OIL EXCELLENT!

Using Cities Service DC-840 Oil for power cylinder and crankcase lubrication in its Fairbanks-Morse diesels, Wheatland Electric Cooperative, Inc. has observed the following results: No overhaul or major breakdown . . . rings free in groove with no sign of wear . . . no oil change at end of 9,000 hours . . . 3500 H.P. hours per gallon of lube oil.

MOBILE DIESEL

A report from the Farbizo Coal Co., Dover, Ohio: Using Cities Service DC-330 Oil for two years for its Marion 111 M Shovel, Farbizo observed the following results: No motor breakdown or repairs in 16,280 hours. Oil consumption 1 pint per week . . . same as when shovel was new. Motors recently inspected, but no repairs or replacements needed. Similar results using DC-300 Oil in two Gradall shovels and International TD 24 Bulldozer.

STATIONARY DIESEL

A report from Wheatland Electric Cooperative, Inc. — largest Rural Electrification Association Plant in Kansas. Plant uses Fairbanks-Morse Diesels, serviced by Cities Service DC-840 Oil for power cylinder and crankcase lubrication:

1. House operation each unit—13,000 hours
2. No oil changes due to oil failure
3. No overhaul or major breakdown
4. Rings Free in groove with little or no signs of wear
5. Oil consumption remains within manufacturer's recommendation
6. Fuel consumption at 10,572 BTU/KWH a load factor of 63.7%
7. Maintenance of lube oil at minimum expense
8. 3500 H.P. hours per gallon of lube oil
9. No wear on main rod or bearings
10. No oil change at end of 9,000 hours

These two reports are typical of the results achieved by the use of Cities Service products in hundreds of diesel operations throughout the country. Perhaps Cities Service can do a similar job for you. For details, contact your nearest Cities Service representative or write Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

An important announcement to fleet operators:

"Ethyl" Diesel Ignition Improver

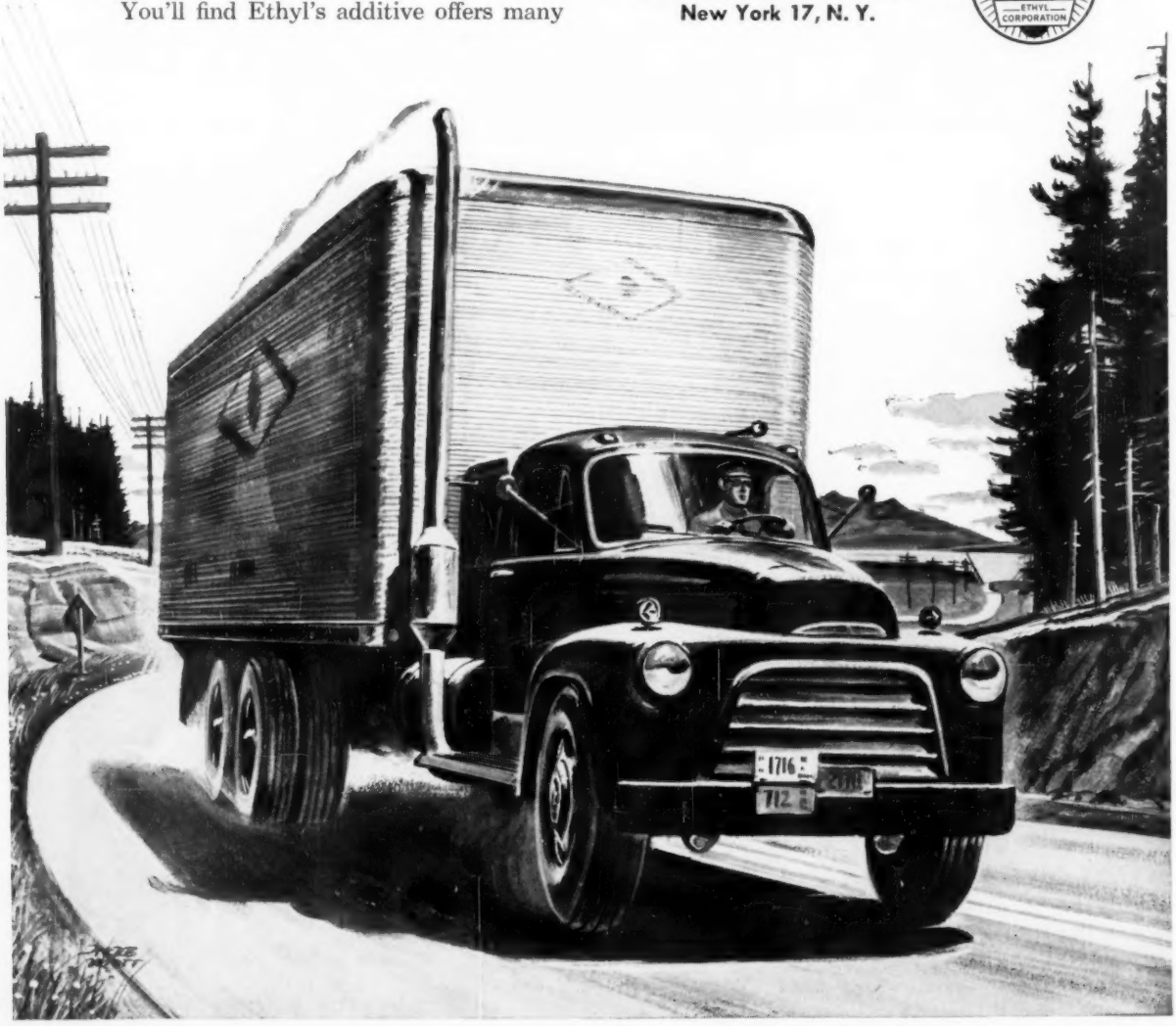
now in use in diesel truck fuels

For over a year fuels upgraded with "Ethyl" Diesel Ignition Improver have been used commercially in diesel trucks.

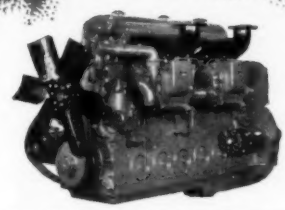
Previous to this, a 300,000 mile over-the-road test in diesel trucks and year-long tests in railroad locomotives and marine engines proved that fuels could be effectively upgraded with Ethyl's cetane-improving additives.

You'll find Ethyl's additive offers many advantages. It makes possible fuels with lower pour point, higher volumetric heating value, and more uniform ignition quality. This, in turn, tends to minimize cold-weather operational problems, increase operating economy, and reduce maintenance costs.

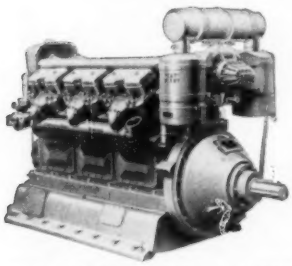
ETHYL CORPORATION
New York 17, N. Y.



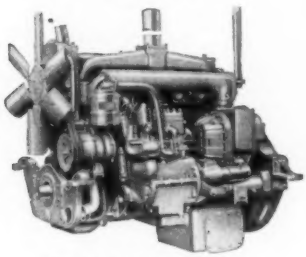
SOME FAMOUS ENGINES EQUIPPED WITH SCHWITZER-CUMMINS TURBOCHARGERS AND SUPERCHARGERS



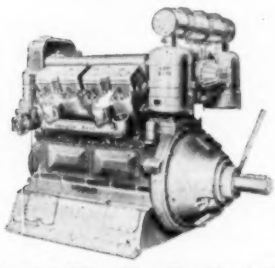
Model 687-C—Harnischfeger Corporation 6 cylinder, 2 cycle using two S-C superchargers.



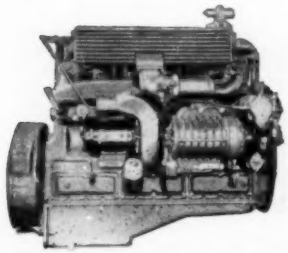
Model D-397—Caterpillar Industrial Diesel V-12.



Model D-337—6 cylinder—Caterpillar Diesel.



Model D-375—Caterpillar Diesel V8.



Model HRBS-600—Cummins Engine Company, Inc. (Used also on HBS Series.)

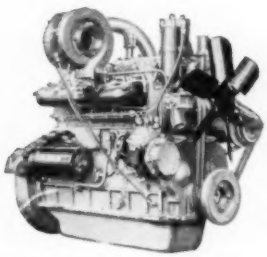
POSITIVE DISPLACEMENT TYPE—EXHAUST DRIVEN TURBOCHARGERS

More than twenty-five years of research, intensive engineering, wide field experience and unexcelled manufacturing facilities are back of our product.

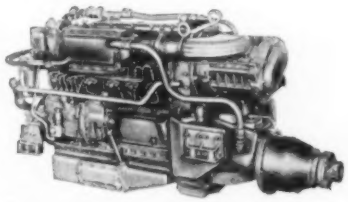
Its excellent service record in tens of thousands of applications under the most severe operating conditions has established Schwitzer-Cummins turbochargers and superchargers as products of supreme worth.

We build superchargers for trucks, busses, earth-moving equipment, power plants, submarines, in fact for all uses up to 800 hp.

We can offer the last word in engineering assistance and the ability to produce efficiently.

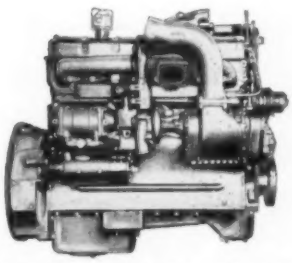


Model 135-DKBS—Waukesha Motor Company with Schwitzer-Cummins Turbocharger.



Model DIX6ES—Hercules Motor Corporation Diesel with Schwitzer-Cummins Supercharger.

SCHWITZER-CUMMINS
Also
Supercharges Engines
for
MACK-INTERNATIONAL
INGERSOLL-RAND
AND OTHERS



Model JBS-600—Cummins Engine Company, Inc. New High Speed Engine

Other Schwitzer-Cummins Products

• OIL PUMPS • WATER PUMPS • COOLING FANS • CRANKSHAFT VIBRATION DAMPERS • AUTOMATIC SHAFT SEALS • AIR STARTING MOTORS • THERMOSTATICALLY CONTROLLED FAN DRIVES

Air Starting Motors and Thermostatically Controlled Fan Drives manufactured for and sold exclusively by the Bendix-Westinghouse Automotive Air Brake Co., Elyria, Ohio.

SUPERCHARGER SPECIALISTS FOR OVER 25 YEARS

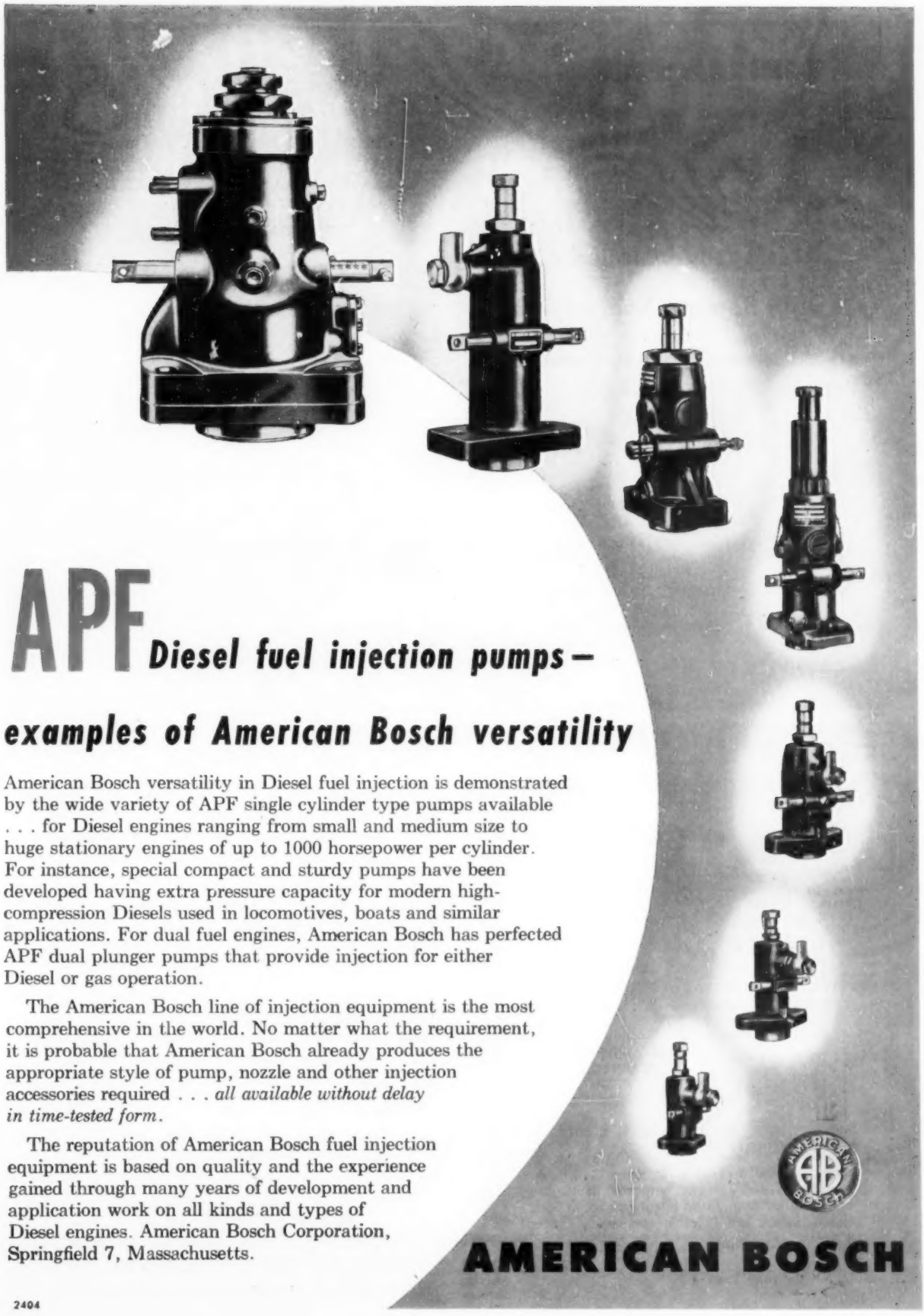
SCHWITZER-CUMMINS COMPANY
1125 MASSACHUSETTS AVE. • INDIANAPOLIS 7, INDIANA

YOUR FORGING PROBLEMS can be solved at NATIONAL FORGE

These cylinder blocks are used in high pressure pumps Extreme service requirements and frequent replacement indicated to our metallurgists the need for a high alloy, basic-electric steel thoroughly heat-treated. By making the necessary changes, the blocks are now giving long life under severe service usage . . . another example of our cooperation in solving a customer's problem.

The facilities at National Forge permit a large diversification of forgings for many applications. No matter what your need, there is an answer to your special problem. Send us your inquiries for your problem forgings.

NATIONAL FORGE AND ORDNANCE COMPANY
PRODUCES BETTER STEEL FORGINGS AND MACHINE WORK
IRVINE, WARREN COUNTY, PENNSYLVANIA



APF *Diesel fuel injection pumps—*

examples of American Bosch versatility

American Bosch versatility in Diesel fuel injection is demonstrated by the wide variety of APF single cylinder type pumps available . . . for Diesel engines ranging from small and medium size to huge stationary engines of up to 1000 horsepower per cylinder. For instance, special compact and sturdy pumps have been developed having extra pressure capacity for modern high-compression Diesels used in locomotives, boats and similar applications. For dual fuel engines, American Bosch has perfected APF dual plunger pumps that provide injection for either Diesel or gas operation.

The American Bosch line of injection equipment is the most comprehensive in the world. No matter what the requirement, it is probable that American Bosch already produces the appropriate style of pump, nozzle and other injection accessories required . . . *all available without delay in time-tested form.*

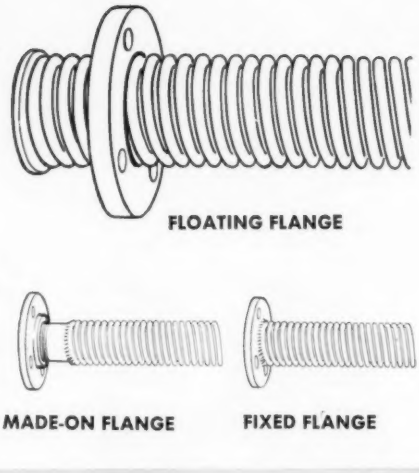
The reputation of American Bosch fuel injection equipment is based on quality and the experience gained through many years of development and application work on all kinds and types of Diesel engines. American Bosch Corporation, Springfield 7, Massachusetts.

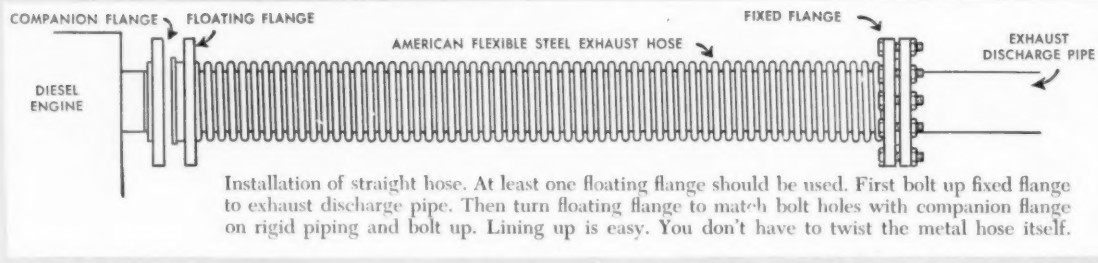
AMERICAN BOSCH

2404

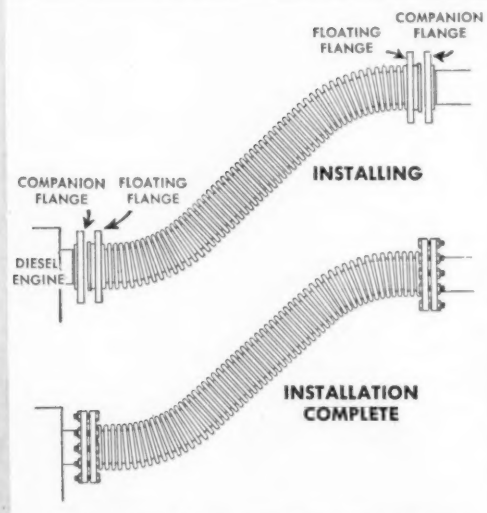
AMERICAN FLEXIBLE STEEL HOSE

Here's how it is easily installed with floating flanges in diesel exhaust systems





Installation of straight hose. At least one floating flange should be used. First bolt up fixed flange to exhaust discharge pipe. Then turn floating flange to match bolt holes with companion flange on rigid piping and bolt up. Lining up is easy. You don't have to twist the metal hose itself.



Installation of bent hose. Two floating flanges should be used. You can make connections easily even though bolt holes in companion flanges are not lined up. Simply turn floating flange at each end to match bolt holes in companion flange. Then bolt up.

American Flexible Steel Exhaust Hose can be supplied with either fixed, made-on or floating flanges. Because this hose is *flexible* it bends into desired position easily. It absorbs vibration readily and prevents its transmission into surrounding structures. It also allows for expansion and contraction caused by temperature changes in the exhaust lines. It prevents overstressing of bolts and distortion of engine parts.

American Flexible Metal Hose for exhaust and air intake – marine or industrial diesels – is available in corrugated steel, 2 in. to 16 in. I.D. inclusive. For more information, write for Bulletin EH-50-1 to: *The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn. In Canada: The Canadian Fairbanks-Morse Co., Ltd.*

OTHER PRODUCTS FOR DIESEL USE – Flexible tubing with wire braid covering for: starting air, circulating water, fuel oil, lubricating oil. Tubing available in bronze, carbon steel and stainless steel. Assemblies complete with fittings. 54214

WHEREVER CONNECTORS MUST MOVE

AMERICAN

flexible metal hose and tubing

an ANACONDA® product

The Engineer's Report

CASE HISTORY

PRODUCT *Chevron Starting Fluid*

FIRM *San Francisco Chemical Co, Montpelier, Idaho.*

Fast starts save 50 man-hours each day!

WITH TEMPERATURES DOWN TO 20 BELOW ZERO for weeks, Chevron Starting Fluid speeds up starts of trucks, tractors and shovels at San Francisco Chemical Co.'s phosphate mine at Leefe, Wyoming. Winter temperatures here sometimes drop to 50 below zero, but even then Chevron Starting Fluid makes it possible to start both diesels and gasoline engines. According to Mr. P. S. Pugmire, General Superintendent, this occasionally saves the mine up to 50 man-hours a day — about 2 hours starting time for drivers of trucks and tractors, also time of other workmen who cannot begin work until equipment is operating. Chevron Starting Fluid is available in 1-pint cans and in 7- and 17-cc gelatin capsules. Your supplier also has the new Chevron Pressure Primer System using safe 9.9-cc pressurized steel bulbs which, when punctured, force priming fuel into air intake system, permitting instant ignition.

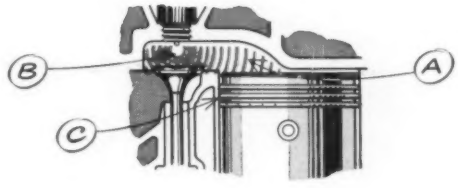
FREE FOLDERS tell you more about Chevron Starting Fluid and the Chevron Pressure Primer System Write or ask for them today.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your distributor, write or call any of the companies listed below.

CHEVRON STARTING FLUID

TRADEMARK "CHEVRON" REG. U. S. PAT. OFF

How CHEVRON Starting Fluid Starts Gasoline and Diesel Engines Instantly



A. Atomizes in lowest temperatures and provides easily ignited vapor in combustion chamber.

B. Pressure, or the weakest spark, fires mixture—turns engine and heats air for regular fuel mixture.

C. Contains lubricant and additives—inhibits cylinder wear and ice formation in primer equipment.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Barber, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

AB. DAVY ROBERTSONS MASKINFABRIK
Gothenburg — Sweden Organized 1851
MANUFACTURERS OF

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Piston Rings

FOR ALL TYPES OF ENGINES

All sizes—½" to 96" in diameter—many styles and types

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Daros Rings are made of world-famous Swedish Charcoal Iron, noted for its resistance to wear—long life. Daros Anti-corrosive Swedish Iron (an exclusive material) is rendering remarkable service in Diesel and Gas Engines that burn fuels containing sulphur and other corrosives.

Daros Rings are used in original factory assembly by a large number of Engine and Compressor Manufacturers all over Europe. More than 50% of all the Motorships throughout the entire world operate with Daros Piston Rings. Many European Railroads specify Daros Rings as replacements in their Diesel and Steam Locomotives.

Immediate delivery on Daros Piston Rings is being made from Chicago on popular sizes and types for large bore Diesels and Gas Engines; delivery time on all other sizes—four to six weeks. Shipments to South and Central America will be made direct from Gothenburg, Sweden.

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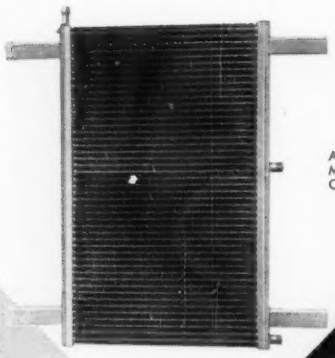
D. D. Cook, President

1737 Howard Street **Chicago 26, Ill., U.S.A.**

Address inquiries from U.S.A., Alaska, Hawaii and Puerto Rico to: DIESEL ENERGY CORPORATION, 143 Liberty Street, New York 6, N. Y. Certain territories open for distributors.



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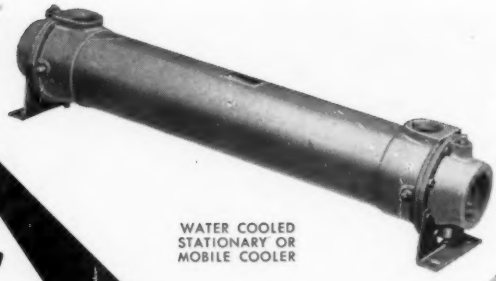

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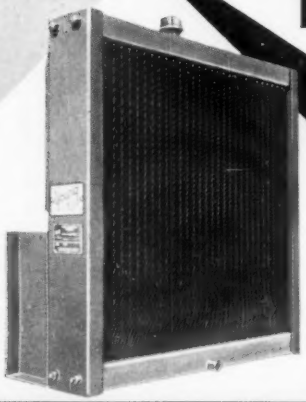
YOUNG offers a complete cataloged line of TORQUE CONVERTER COOLERS



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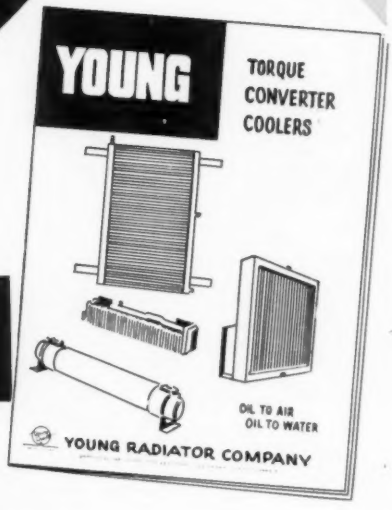
. . . for mobile and stationary applications up to 600 hp. Applications above 600 hp. to special design



Now Young supplies industry the first catalog ever issued on a complete stock line of Torque Converter Coolers. These coolers are engineered for any *mobile* or *stationary* application from 50 to 600 hp . . . for oil-to-air or oil-to-water cooling. Young air cooled *mobile* oil Coolers are designed for 150 and 300 hp engines. *Stationary* type oil-to-air Coolers are available in 4 models; OCS 175, 300, 450 and 600 for engines from 100 HP up. Also, 11 standard water-cooled shell and tube type Coolers are built for *mobile* or *stationary* application. Shipment from stock makes possible quick delivery at lower unit cost. For further details see your nearest Young Representative.

Send today for the FREE new Young Torque Converter Cooler Catalog No. 1054. It contains product features and illustrations, dimension and performance data on the entire Young Line.

Heat Transfer Products for Automotive, Agricultural, Industrial, Gas and Diesel Engine Application.

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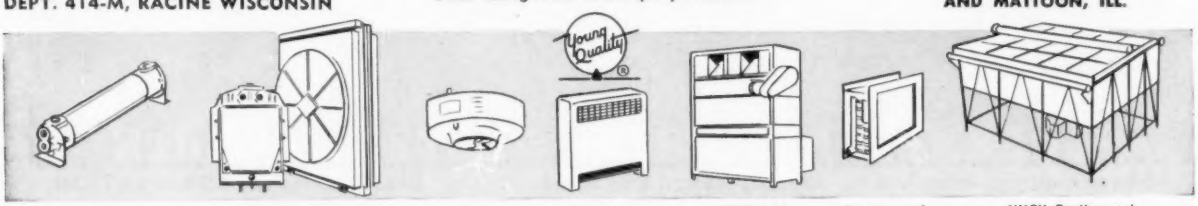
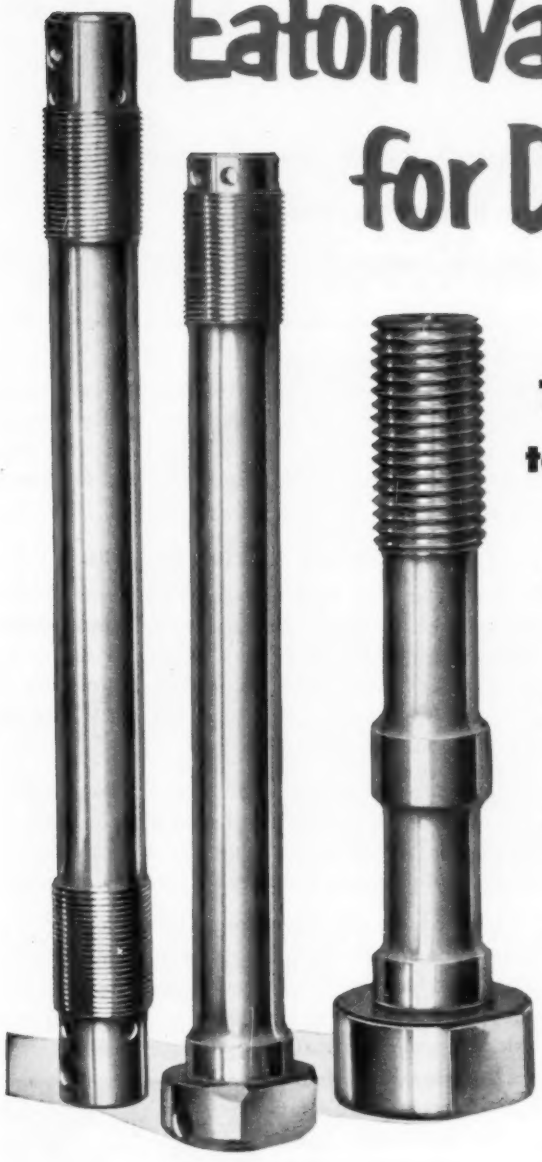


Shell and Tube Heat Exchangers | Automotive and Industrial Radiators | Unit Heaters | Convector Radiators | "YAC" Air Conditioners | Heating and Cooling Coils | "HC" Cooling and Condensing Units

Eaton Valves and Bolts for Diesel Engines



Reflect the Experience of Thirty-Five Years as a Supplier to Leading Diesel Engine Builders

- **Years of forging experience, plus the most modern forging equipment**
- **Heat treatments under strict metallurgical control**
- **Highly specialized precision production facilities**
- **Rigid adherence to customer specifications**

EATON

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PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

Random Thoughts from a Filter Engineer

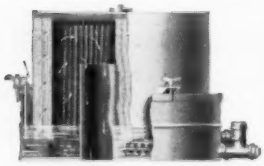
by Frank Purvis

- KEEPING EFFICIENCY HIGH AT LOW AIR FLOWS
- PENNY WISE AND POUND FOOLISH
- HELP FOR THE ABSENT-MINDED

KEEPING EFFICIENCY HIGH AT LOW AIR FLOWS

Unfortunately, it is true that efficiency of oil bath filters will decrease with the lowering of air velocity. In fact, at low air flows, some filters won't work at all. That's because there's not enough oil in motion to provide the vigorous scrubbing action needed to keep efficiency high.

We at Air-Maze have devised a way to minimize the drop in efficiency. Our oil bath filter assures thorough washing action at the lowest air velocities. How do we do it? A patented oil recycling method makes oil available at low flows so that the element continues to get a wash even when the engine is running at 10 to 15% of capacity.



Air-Maze oil bath air filter

Besides keeping the efficiency high when the air flow is low, our oil bath filter has another safety feature we feel is important. When the engine is shut off, the oil acts as a seal against air and moisture.

PENNY WISE AND POUND FOOLISH

We doubt if any owner of a new $5,000 Cadillac would shop around for the cheapest oil just to save a few pennies. Cheap oil can ruin delicate working parts. Why endanger a big investment for pennies?

Yet, we've always been a little amazed to see owners of $150,000 diesel engines shop around for the "cheapest oil" by buying air filters on the basis of price alone—instead of *protecting* their expensive investment with the best oil-bath air filter money can buy. Some diesel owners often forget that it takes only a little dirt in the air intake to cause a lot of damage to highly polished diesel parts such as rings, ring grooves and liners.

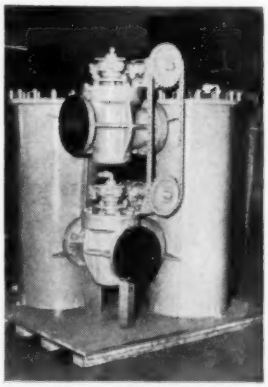
We're reminded of an advertisement we saw sometime ago which makes this point rather neatly. It said: "You can't afford to buy the cheapest! Buy the best and save!" We think there's a lot of good old-fashioned horse sense here.

HELP FOR THE ABSENT-MINDED

Here's a boon for forgetful people. Our new duplex lube oil filter for marine and stationary diesels makes it physically impossible to shut off the oil supply to the engine when cleaning the filter. Thus, it completely eliminates the danger of delicate diesel parts burning out due to lack of lubrication.

It has two parts—each a separate filter. They're connected by a chain linkage so that when one filter is turned off for cleaning, the other one is automatically opened. No shut downs necessary for filter maintenance.

This filter has more than a special safety control. It's a glutton for dirt. It stops damaging particles as small as .0032" and handles 360 gpm. at normal lube pressures up to 100 psi. It filters at high flows by using multiple cartridge assemblies, providing an exceptionally large filtering area. And drain plugs near the bottom of the filter shell easily drain off sludge contaminate.



Air-Maze duplex lube oil filter

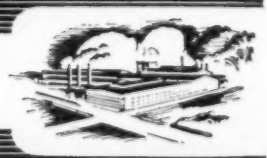
All in all, we think this is quite a filter. It readily met the exacting requirements of a large insurance company. If you're in the market for a better lube oil filter, why not look at this one? The Air-Maze Corp., 25000 Miles Ave., Cleveland 28, Ohio.

AIR-MAZE
The Filter Engineers
AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS

Tons of STEEL... Forged and Machined to Exacting Specifications at ERIE FORGE!

THE main press cylinder here illustrated is a part of a huge extrusion press for the Air Force. Some of these presses are rated at 50,000 tons. This forging was produced from ingot to finished job here at Erie Forge & Steel Corporation. Extremely close tolerances were required on the finished part with particular attention being paid to the polished finish on the interior walls. Expert craftsmen performed every operation here in our plant . . . one control, one responsibility. We are specialists in producing steel forgings—all shapes and sizes. Consult with Erie Forge on your next forging requirements.

ERIE FORGE & STEEL CORPORATION
ERIE, PENNSYLVANIA



It Costs No More To Give More—
If You Give The Bonus In Savings Bonds!

If your company is one of the more than 45,000 companies that have the Payroll Savings Plan you *know* what your employees think of Savings Bonds—they spell it out for you every month in their Savings Bond allotments.

If you don't have the Payroll Savings Plan, and are wondering whether your people would like to receive their bonus in Bonds, here are a few significant facts:

—every month, *before they get their pay checks or envelopes*—8,500,000 men and women enrolled in the Payroll Savings Plan invest $160,000,000 in U. S. Savings Bonds.

—Payroll Savers hold their Bonds: In the three years since the popular E Bond commenced to mature (May, 1951 to September, 1954) over $14,000,000,000 have come due. Throughout this period approximately 75% of the maturing bonds were retained by their owners under the automatic extension plan.

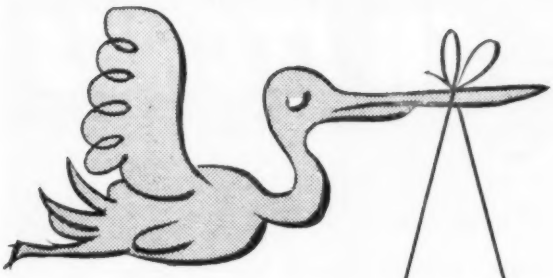
—on September 30, 1954, the cash value of Series E and H Bonds—the kind sold only to individuals—totaled 37.8 billion dollars, a new high.

To the Payroll Saver, and to the man who buys his Bonds at a bank (because his company does not provide the Payroll Savings Plan) a One Hundred Dollar Savings Bond looks bigger and better and *is* bigger and better, than a check for $75. *Make this a merrier Christmas for every employee. Give the gift that keeps on giving.*

The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

DIESEL POWER

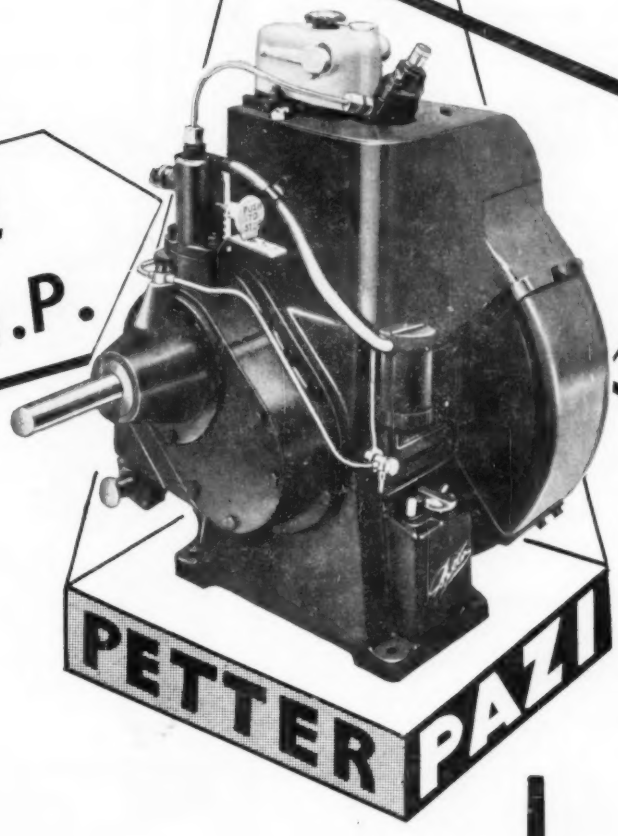
A NEW ARRIVAL



To the Petter air-cooled diesel engine family

1½ & 2½ H.P.

Range NOW 1½ - 40 H.P.



BACKED BY A WORLD-WIDE PARTS AND SERVICE ORGANISATION FOR THE 360,000 ENGINES IN USE

WRITE FOR INFORMATION
A FEW CHOICE DISTRIBUTORSHIPS OPEN

THE PETTER SMALL ENGINE DIVISION OF BRUSH ABOE, INC.
Office and Showroom 60-07 39th AVE, WOODSIDE, NEW YORK

SPEED SENSITIVE SWITCHES

MODEL GHM

Synchro-Start has re-designed its line of SPEED SENSITIVE CONTROLS in one, two and three switch units so that they will give still longer life, better accuracy and be more economical to build.

These speed sensitive switches are available in two body designs. The GS series is adaptable to standard distributor take-off to accommodate gear or coupling drives and the rotating parts run in oilless bronze bushings. The GH body design is for standard SAE tachometer drive and runs in oil sealed ball bearings, lubricated for life.

These units contain snap action switches rated at 10 Amps.-110 Volts A. C. and can be used for either opening or closing a circuit at any RPM over 500. They can be adjusted while the engine is running for a plus or minus 20% of set speed.

The models shown here were designed for overspeed shutdown and are made for either automatic or manual re-set. Dust caps can be furnished with a variety of standard or special connector fittings.

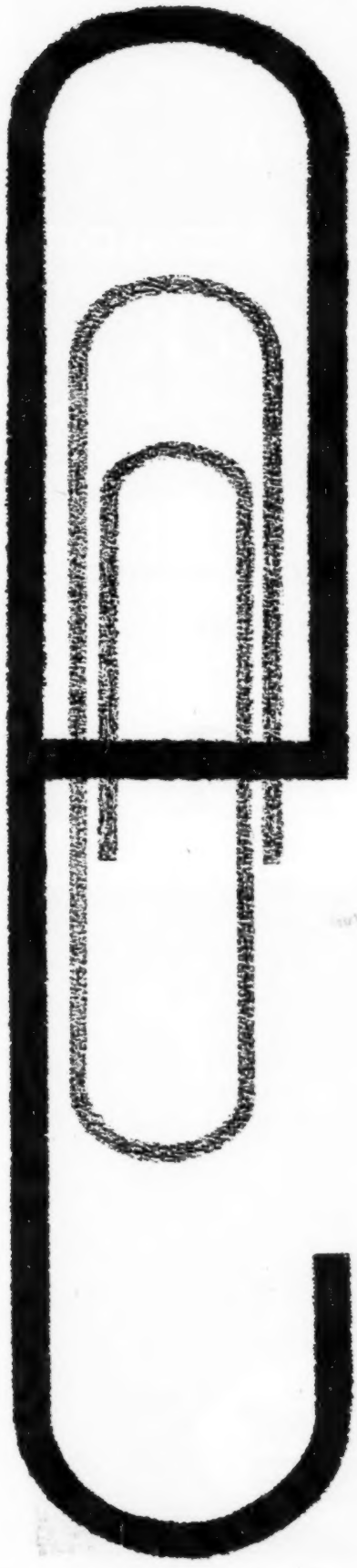
Write us for the correct model for your installation

MODEL GSA

Synchro-Start Products Inc.

Mfrs. of Automatic Engine Controls

8151 N. RIDGEWAY AVE.
SKOKIE, ILLINOIS



editorially speaking

A Fable for Today

In a far corner of the land lived a man who labored steadily and using a machine burning spirits called gasoline did earn his daily bread. Old was the machine and there were times when it did fail. Then the man would run quickly to the nearby village where for a piece of silver he would get a part and the knowledge to install it well. With haste he would make the machine to run and so despite its frailties he lost not all his day's earnings. But it did in time expire. The prudent man had stored away silver against this day and when he counted it said, "I have saved enough for the machine called diesel. I will go first class". He did obtain this machine and for him it did labor mightily. Many were the good and fruitful days and he prospered. But as must happen with all things there came a time when it did fail. Taking his piece of silver he did run to the village as before. "Nay," he was told, "you must travel many many leagues to a place where such parts are kept". Donning his best robes he traveled to this place. It was costly and he did lose his earnings while away. And they said unto him, "This part you can buy not for one but for many pieces of silver. But to what avail? Only we have the magic to install it. Send us your machine and it will come back as new". This he did at great cost for carting his machine and for the labor thereon. And he did lose his earnings for many days. Totaling the cost he did find that his store of silver had dwindled. Whereupon he tore his hair in anguish crying, "Alas, I was better off with my old machine. I will get another". But it came to pass that he met a man who said, "We too sell the diesel machine. We are near unto you with a store of many parts and will tell you their use so that you can keep your machine earning bread for you". So he did buy the machine and is now contented. It labors faithfully for him and when it does fail there is little idleness and the cost within reason. Yea, and he plans to buy another.

As Aesop might have said, "Adequate parts availability and service data keeps happy users and sells engines".

D.E.

Cyclan retains full tension up to 600° F.

No other piston ring material combines so many advantages as

Cyclan

- Cyclan is Sealed Power's new alloy for extreme operating conditions.
- Cyclan's strength approaches that of steel.
- Cyclan's resilience exceeds that of cast iron.
- Cyclan retains the bearing characteristics of cast iron.
- Cyclan has extra high impact value for resisting shock.
- Cyclan rings retain their true shape even after considerable deflection.
- Cyclan piston rings are especially durable in super-charged engines.
- Cyclan can be readily chrome-plated, but functions efficiently without plating.
- Cyclan is available for original equipment rings in heavy duty engines.
- Some Sealed Power Cyclan Ring Sets are available for replacement use now. Others will follow soon.

Let our engineers tell you the Cyclan story!

SEALED POWER CORPORATION, MUSKEGON, MICHIGAN

Sealed Power

PISTON RINGS · PISTONS
CYLINDER SLEEVES

highlights

■ The Long Island Railroad has ordered its first two diesel rail cars from the Budd Co. These are slated for service between Babylon and Patchogue and represent part of the Long Island's 60 million improvement program.

■ Golden anniversary meeting of the SAE will be held at the Sheraton-Cadillac Hotel and Hotel Statler in Detroit, Mich. from January 10 to 14, 1955.

■ England is currently testing a 35-ton gas turbine powered tank. The unit was developed by a division of the Ministry of Supply and constructed by C. A. Parsons, Ltd.

■ EMD recently delivered 17 Model GP9 diesel-electric locomotive units to the Grand Trunk Western, which is owned by the CNR. The Grand Trunk system covers 1153 mi in the United States.

■ It was recently reported that Diesel Nacional S.A. of Mexico will start producing diesel engines in the near future. It is expected that the firm will produce approximately 4000 units during the first year of operation.

■ Completion of Canadian Pacific's latest order for 100 diesel-electric locomotive units will bring their diesel fleet total to 509. This will enable the road to dieselize its principal passenger and freight trains operating on the 2881-mi transcontinental run from Montreal to Vancouver.

■ Santa Fe Railway has announced the start of "piggy-back" (trailer-on-flatcar) service between Chicago and Kansas City and also in the Los Angeles-San Diego area. Santa Fe says, ". . . freight will be picked up at the shipper's warehouse and delivered to the consignee's warehouse at the same rates and minimums applying for the same service by highway freight carriers."

■ Popularity of the small diesel continues to grow in England as applications increase. The 2-cycle diesel in particular is currently receiving considerable attention.

■ A recent report tells us that 30 years ago the Erie railroad owned 1545 steam locomotives. In contrast, today this road has 472 diesels and is completely dieselized for both freight and passenger service.

■ The aluminum producers continue to exceed previous production marks. Another all-time high was chalked up for the third quarter of 1954. Third quarter total for the production of primary aluminum was 743,581,012 lb.

■ Cleaning traction motor cores for GM diesel locomotives, formerly done by hand in about 14 hr, is now done in 1 hr with ground-up apricot pits in a special device. It's called a "wheelabrator" and was designed especially for EMD.

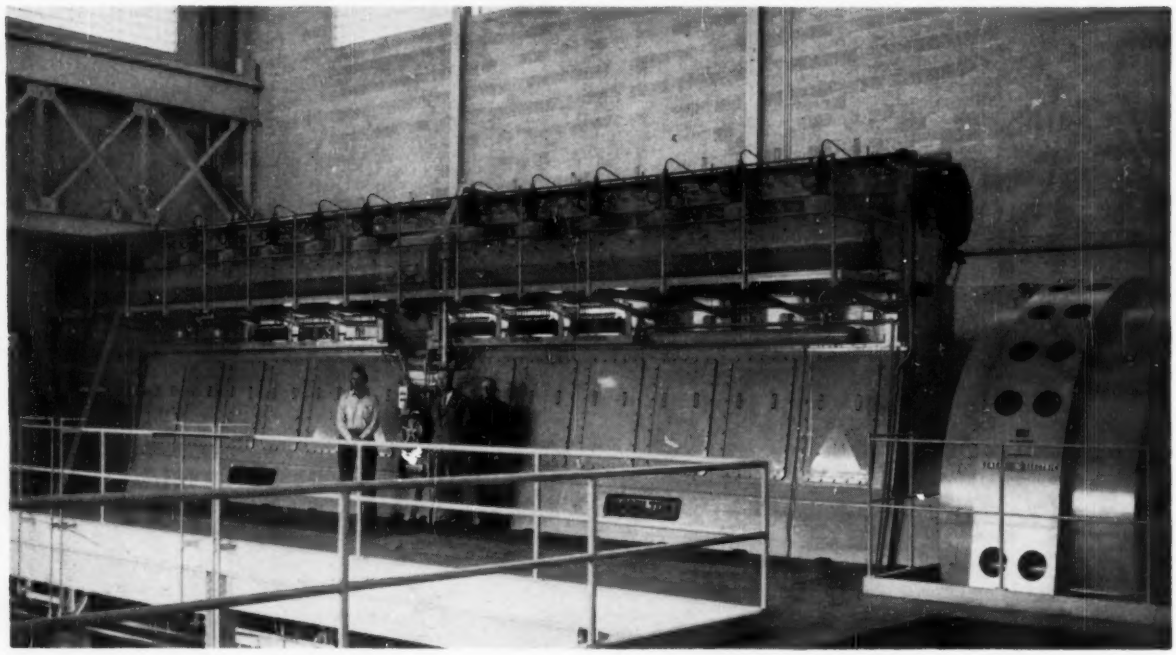
■ Chicago, Ill. will be the site for the next Plant Maintenance and Engineering Show. It will be held in the International Amphitheater from Jauary 24 to 27, 1955. Staged for the sixth time, the show will reportedly be the largest in its history.

■ A contract has been assigned by the Navy to the Packard Motor Car Co. for the development of a gas turbine engine. The specifications call for a gas turbine of high shaft horsepower, economic fuel characteristics, long life between overhauls, and which will be adaptable to mass production methods.

■ Major General Paul F. Yount, in a paper presented before the 34th Annual Meeting of the American Petroleum Institute, stated: "A single armored battalion requires 17,000 gal of gasoline to move 100 mi." It seems like a switch to diesel could prove extremely economical in such cases. Especially since diesel fuel must be brought up for engineer equipment.

Decatur Plans for Economy

Take an existing coal-fired steam plant, add a big diesel burning No. 6 fuel and capable of conversion to dual-fuel operation, and you have flexibility — flexibility to take advantage of fuel economics and relative thermal efficiencies.



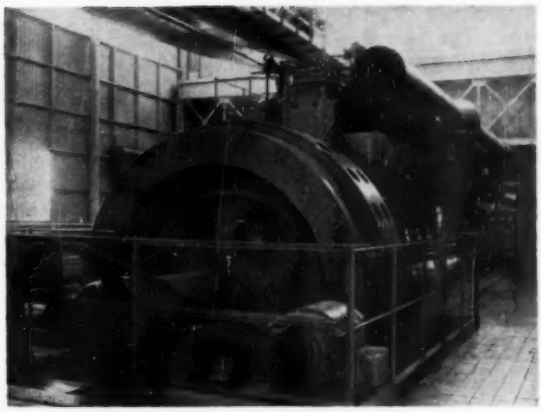
Decatur's new engine is a Model 1221-SA Hamilton with a net rating of 5380 hp at 240 rpm. Adequate space has been allowed for the installation of a similar engine should the need arise.

THERE is no arguing with the needle on the kilowatt meter. When it begins to hover around the figure representing the power plant's rated capacity, something must be done—and fast. But it is a good deal better to do what Decatur, Ind. officials did: anticipate the future need for more generating capacity and plan carefully for it.

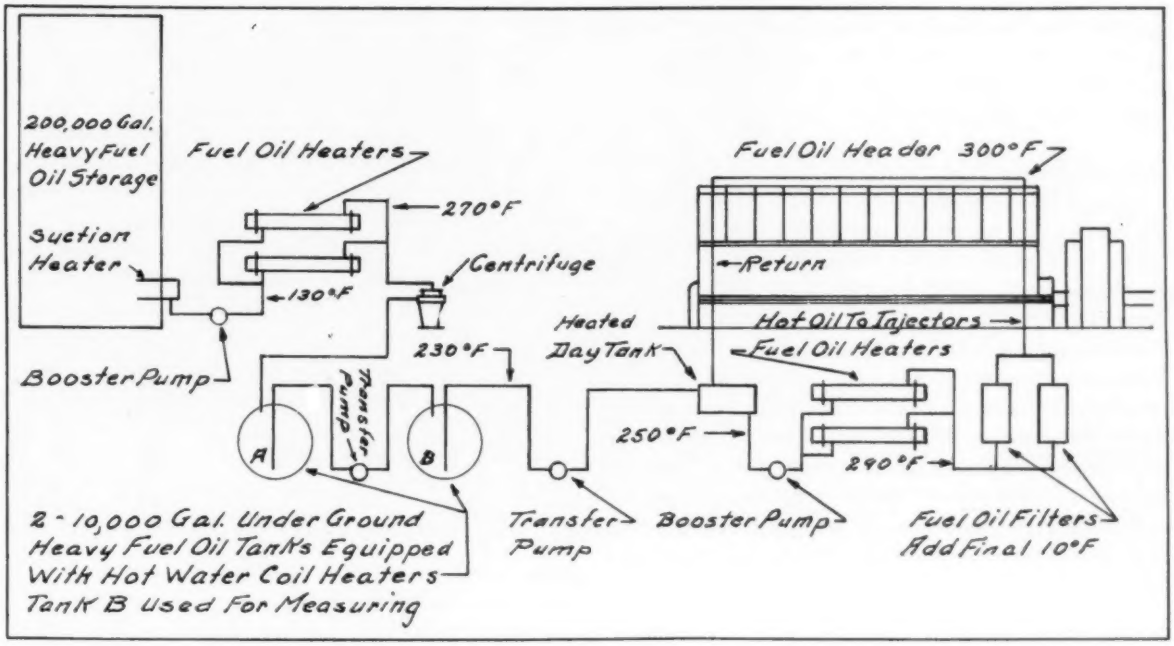
As in all municipal power plants, the slope of Decatur's load growth curve was there to see. With the record of load fluctuations and particularly peak loads, it was possible to project the time when additional capacity would be needed and to plan for it.

Somewhat over 7500 persons depend upon Decatur's municipally-owned power generating plant for electricity. Steam turbines with coal-fired boilers supplied this need for many years. Now, additional capacity was needed. This was not the question since you can't argue with

Operating on residual fuel, the Model 1221-SA Hamilton engine turns the main generator at 240 rpm. The latter has a net rating of 3810 kw.



Below is a diagram of the heavy fuel handling system developed for Decatur by Baldwin-Lima-Hamilton engineers. Temperatures at various phases are noted.



that needle, but rather the problem was how to provide the additional capacity so as to achieve the maximum overall operating economy.

This problem was approached with a completely open mind; all possibilities were considered. Consulting engineers were brought in to make an analysis and come up with specific recommendations. Anyone who automatically assumes that diesels and steam are not compatible will be surprised at their recommendation—it was a diesel.

One of the requisites for the engine selected was that it must be able to burn heavy residual fuels of the cheapest possible price, and further that its original design be such that inexpensive conversion to dual-fuel operation was possible. The latter would be an "ace in the hole" should natural gas become available in the city.

With this arrangement of diesel and turbine, duty could be split between the units so as to get the lowest overall operating costs. Thus, the diesel could operate as a standby unit, handle peak loads, or carry the base load as determined by the comparative fuel cost and the two units' relative thermal efficiencies.

Equipment Selected

The engine selected was the Hamilton Model 1221-SA, rated 5380 bhp (net) at 240 rpm. It is a big engine, reportedly the second largest single-acting engine east of the Mississippi.

The twelve cylinders have 21½-in bores and 27½-in strokes. The 2-cycle operation is improved to permit higher bmep's by the use of Hamilton's rotary exhaust valves that allow the exhaust ports to be opened first for blowdown and close first while air is still flowing into the cylinders.

Scavenging air is provided at 3.25 psig by a separately driven blower. The blower, rated 23,900 cfm, is powered by a 3550-rpm, 2300-v, 450-hp induction motor operating on power supplied from the main generator through a transformer. The blower starts and stops automatically with the engine. Motor-operated inlet guide vanes automatically adjust the air flow to suit load and climatic conditions.

The main generator, rated 3810 kw (net) and 4250 kw (gross) at 240 rpm, is coupled directly to the engine crankshaft. The exciter is separately mounted and is driven at 1150 rpm by pulleys and belting from an extension on the rotor shaft.

For maximum utilization of the fuel's thermal potentialities, waste heat recovery units were incorporated in the exhaust system. This consists of heating coils in the muffler. Heat recovered in this manner is used in conjunction with an oil-fired boiler to heat the fuel progressively as it passes from storage tank to engine. The boiler is fully automatic and cuts in and out as necessary.

Burning Heavy Fuel

Baldwin-Lima-Hamilton engineers developed the system for handling the heavy fuel and getting it to the engines. As for what happens in the engine, they can take a bow too. In the words of Mr. L. C. Pettibone, Decatur's plant superintendent, "Studying the design features of our Hamilton engine, I find that this engine provides for the turbulence necessary at the time of injection and gives considerably more air in the cylinder, so necessary for the correct burning of heavy fuel. That is why we can so successfully burn the very heaviest residual fuels on the market today without excessive mechanical failure."

First, let's see what fuel is being burned and then how it is done. The particular No. 6 fuel being used has the following analysis:

Specific gravity at 60°F	0.9736
API at 60°F	13.9
Viscosity at 100°F	5520 SSU
at 180°F	459 SSU
at 210°F	241 SSU
Water and sediment	1.40%
Water by distillation	.36%
Ash	.048%
Flash point (open cup)	340°F
Fire point	410°F
Carbon residue	11.21%
Sulphur	.74%
HHV, BTU/lb.	19150
LHV, BTU/lb.	18150

The flow through the system, the items of equipment involved, and also the temperatures, are shown on the accompanying schematic diagram. Note that oil temperatures are progressively increased with the exception of the flow to the centrifuge. Presumably the additional heat was necessary at this point to decrease the oil's viscosity in the interest of better centrifugal purification.

Decatur's new modern power plant was erected to house the new engine. With an eye for the future, adequate room allowed for the addition of a similar engine when needed.

Results are the Payoff

The flow diagram and temperature ranges show a setup that works very well with this engine and with this fuel. Temperatures are somewhat higher and the hookup somewhat different from those in some other plants burning heavy fuels. We emphasize this before someone says, "We tried that and it didn't work." The point is that it *does* work in this case and here are some of the results.

Mr. Pettibone reports that they "are now averaging 15 kw per gal or better" on the basis of gross generation. He further states that, "This 3810-kw unit is operating 18 to 20 hr per day with an absolutely clear exhaust. We have experienced no unusual piston ring or liner wear and have no mechanical difficulty with the fuel injection system."

Incidentally, this operating figure does not sound like the engine is being used on standby or peak skimming service; it looks more like day-in and day-out operation. Someone must have had a hunch that this would occur because when the engine was being erected in a brand new power plant building back in mid-1953, space had been provided for another identical engine as well as for extension of the plant buildings.

This unit went on the line October 21, 1954 and has been doing a good job ever since. Decatur is now looking forward to the near future when it will install a second engine as current figures show, according to Mr. Pettibone, that if Decatur could dieselize generating facilities 100%, its annual profit would be increased by approximately $35,000 to $40,000.

So Decatur fooled the old needle and carefully planned for the capacity to keep it where it belonged. They planned both for the present and the future, winding up with a steam turbine plant operating on coal and running in parallel with it, a new diesel plant capable of burning residual fuel oil or gas, should it become available.

By reaching a sound solution in the combination of these two sources of power, Decatur thereby provided sufficient flexibility to obtain the greatest overall operating economy regardless of fuel economics, and has done so at a minimum plant expenditure.

Piston head of a large diesel engine processed to increase its resistance to high-temperature corrosion. Protection is afforded by a thin surface layer of aluminum over an aluminum-iron intermetallic compound formed.

Aluminum Coating on Steel Cuts Corrosion

An aluminum-coating process, now commercially available, provides the low-alloy steels with exceptional resistance to both chemical and high-temperature corrosion. Ability to treat shapes, after casting or fabrication, promises many advantages in improving life of certain diesel parts.

THERE are plenty of places in diesel engines and installations where corrosion resistance, either against chemical attack or high-temperature oxidation, is important. With the higher sulfur fuels or sour gases or crudes, it can be a big thing. Many of the internal parts subject to these types of attack can be made of special alloys, say of the high-nickel type. But what of such parts as piston crowns, manifolds, and mufflers?

In the case of mufflers, for example, clad-metals, ceramic coatings, etc., have been tried as an inexpensive method of prolonging their life. In the first case, the "clad" is generally destroyed at certain points during fabrication. Ceramics may suffer from physical

abuse. Now, for the first time, a process is available commercially which would seem to offer a solution for many corrosion problems.

The process, known as "Aldip", was developed and patented by General Motors. It has been licensed to some firms for their own use, but the first licensee with rights to general commercial usage is the Arthur Tickle Engineering Works, Inc., Brooklyn, N.Y. Their trade name for the process is "Alumicoat".

As the name implies, steel (or its alloys) is given a coating of aluminum. Either pure aluminum or its alloys can be applied. A metallurgical bond at the interface is obtained and it is this surface, having aluminum diffused in the ferrous material to an appreciable depth, that alters the corrosion-resistant qualities of the ferrous metal.

This process is not to be confused with the "Alumibond" process of the Fairchild Engine and Airplane Corp. Tickle is licensed under these patents too, and is currently doing work in the diesel field—notably casting a layer of aluminum on the skirts of large cast iron trunk pistons (DIESEL POWER, July, 1951). By nature there is some similarity in the process but the objectives are somewhat different.

Alumibond supplies a metallurgical bond between ferrous metals and a cast aluminum alloy layer so as to make a bi-metallic part to utilize the desirable qualities of each metal. Alumicoat is principally concerned in the formation of a relatively thin surface layer of aluminum over an aluminum-iron intermetallic compound to provide corrosion resistance.

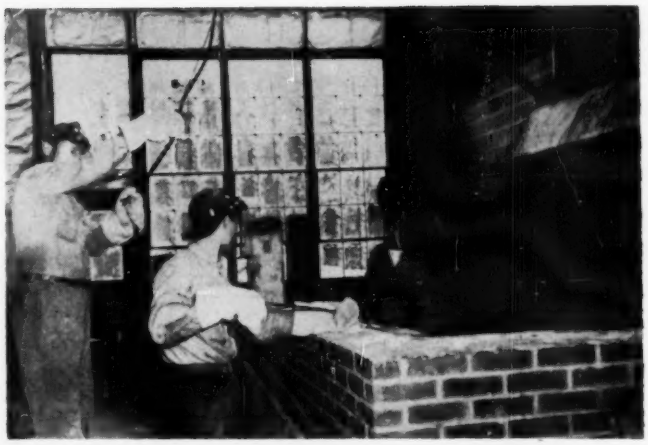
Facilities for both processes have been installed in a a new building exclusively for this work. Required equipment, including that for materials handling, has been arranged to permit "straight-line" production runs. The installed melting capacity for aluminum exceeds 50,000 lb. As to size of pieces that can be handled, limiting dimensions are 15-ft lengths up to 45-in diameter, or 12-ft lengths up to 6-ft diameters.

Mechanics of Process

A principal feature of Alumicoating is its flexibility of application with respect to different shapes. In one case, plenum chambers for some refinery process were to be dipped. The shape was irregular and complicated by the fact that some of the piping connections extended beyond the inner wall and into the plenum. All interior and exterior surfaces, with the exception of flange connections, had to be treated. The process can cope with such requirements.

The initial step is cleaning. Surfaces to be bonded must be free from scale, dirt, greases, paint, etc. The method used must be appropriate to the material and the shape. Steam stripping, sand blasting, and hot caustic dips are commonly used methods.

Areas not to be coated are masked off. A special titania compound was found to be most suitable. This is applied to the surface and allowed to harden.



First step in the process consists of a caustic bath to thoroughly clean the part to be coated. This is important if a good bond is to be had.

After the caustic bath, a steam bath removes all traces of impurities on the surface of the metal. Areas not to be coated are then masked off.

The next step is "fluxing". This consists of a patented salt bath which assures proper bonding of the aluminum to the metal.

Fluxing is the next operation. A special furnace with electrical heating equipment is necessary. The top is covered with rolling doors, opened only far enough to admit the piece to be fluxed. The fluxing bath is a proprietary concoction containing such chemicals as sodium and potassium chlorides, aluminum fluoride, and cryolite. Its temperature is held above 1200°F at a point determined by the particular ferrous alloy to be alumicoated.

The part is lowered into the bath and remains there for a calculated period. When the part is completely fluxed, it is drained and is ready for dipping. During this process the part's temperature is raised to or above that of the aluminum dip.

A molten aluminum dip follows the "fluxing." This is the final step. The engine manifold in the photo has been alumicoated and is being removed from the molten aluminum bath.

The next step is submersion in the molten aluminum. There are two aluminum furnaces, one being narrow and deep and the other having larger opening dimensions and less depth. This provides flexibility to the handling of different shaped parts and also provides for production using two different aluminum alloys.

As an example of how selection of aluminum alloys affects the process, let's consider pure aluminum and an alloy having 12% silicon. First, the pure aluminum requires a higher temperature (1300°F—1400°F) for both dip and fluxing bath. Where these temperatures might affect temper of the metal or produce distortion, the silicon alloy may be used, unless other factors are concerned. Temperatures would then be in the order of 1240°F—1250°F.

Pure aluminum provides better corrosion resistance at the lower temperatures. Corrosion resistance of the silicon alloy would be approximately the same at elevated temperatures.

During the dipping, aluminum penetrates the steel to a depth of 0.0005 in to 0.002 in. The aluminum clinging to the outside is ordinarily about 0.0005-in to 0.005-in thick. Coating thickness is determined by the material used and the immersion time. If a very thin exterior coating is desired, the piece can be returned to the flux bath whereby the excess aluminum is removed while the depth of the aluminum diffusion in the steel is increased. This also would occur if the temperature of the piece when installed and in operation were above the melting point of the aluminum.

Some Results

The aluminum-iron intermetallic compound is hard—65 Rockwell C—and is well known as a refractory material. It can stop or materially reduce high temperature oxidation of mild or low-alloy steels. Tests show that adequate protection is provided at temperatures at least as high as the maximum where the base metal still has useful strength. Temperatures at which such tests have been made with 10w carbon steel have exceeded 1900°F.

Some test data collected to show the protection given is contained below:

Untreated Steel Samples	Temp.°F.	Hrs. Time	Weight Change*
18-8 Chromium Nickel	1350	24	—17.0%
25-20 Chromium Nickel	1350	4	— 8.3%
27% Chromium Steel	1350	24	— 8.4%
Al-coated			
Plain Steel	1350	192	+ 0.1%
18-8 Chromium Nickel	1350	192	+ 0.1%
Plain Steel	1700	48	+ 0.3%
18-8 Chromium Nickel	1700	48	0.0%

*After corrosion scale was tapped off

Summary

Low-alloy or mild steels, Alumnicoated to give the required resistance to oxidation and corrosion, are now being used by design engineers to replace costly high-alloy steels. Jet aircraft components, ships' bolier hot air tubes and economizer elements, diesel components, and petroleum refinery equipment, are some of the current uses of the process.

The availability of a new design "tool" will often engender new and unforeseen uses. Tickle engineers are continually engaged in both process and application experimentation. In the diesel field, the process offers promise in solving some of the corrosion problems that are increasing as the result of trends to higher temperatures and pressures for obtaining higher specific engine outputs and also because of the economic pressures to burn the less costly and often more corrosive fuels.

By spraying the chemical into the air, it is possible to create a shield of dry chemical that absorbs much of the heat. This method can be effective to break out of a fire trap.

ACL'S Fire Prevention-Protection Program

Thanks to an effective overall fire protection program, Atlantic Coast Line's Fire losses over the past 10 years have remained constant, despite a sharp increase in the number of fire hazards.

FIVE years ago, Atlantic Coast Line Railroad took a bold step in its fire protection. It decided to standardize the use of dry chemical fire equipment aboard all its diesel locomotives.

Railroad men considered this a bold step because dry chemical—actually specially-treated baking soda—was at that time comparatively untested as the first line of fire defense in the railroad industry although it has been widely accepted in petroleum, steel and other industries. How has the experiment worked out for the Atlantic Coast Line?

According to Chief Fire Prevention Engineer Robert G. Kooser, The Coast Line has not had an insurance claim for fire damage to a diesel locomotive in three years, excepting fires resulting from wrecks. Also, ACL's fire insurance rate is now "the most favorable" in its history.

Other railroads have also turned to dry chemical during recent years. Coast Line, however, is one of the few that uses dry chemical as a first line of defense, backing it up with a 77-gal pre-mixed foam tank.

Each diesel "A" unit carries three 30-lb Ansul dry chemical extinguishers—one mounted in the cab near the fireman, another in the passageway near the front end, and a third in the opposite passageway to the rear. The foam tank is also mounted near the rear end.

"B" units carry only two 30-lb chemical extinguishers, one in each passageway, but also carry foam. Road switchers are protected by three dry chemical units and foam, while switch engines carry two 30-lb units plus foam.

Unfortunately, Coast Line has no record to indicate the exact number of fires that have broken out on its diesels. The reason for this, explains Mr. Kooser, is that only fires in which damage occurs are reported.

"Yet we know that the dry chemical extinguishers are being used because we know when they are refilled. On this basis, we estimate about 350 fires a year, or almost one a day. Not all of these refills, however, are on diesel units. Some are in shops and other installations. We are not unhappy about this usuage of chemical and cartridges so long as the fires are being put out without any claimable loss."

All-in-all, ACL used approximately 10,000-lb of dry chemical last year. Approximately half of this was used in training personnel and the remainder apparently, used for extinguishing actual fires.

A surprisingly large amount of dry chemical was used, Mr. Kooser said, in extinguishing hot box fires. Although the dry chemical was not originally intended for such use, train crews have developed their own techniques for controlling hot box fires. This consists of knocking down the flames with dry chemical and quickly removing the packing waste with a packing hook.

Change Was Result Of Study

Although it had little more than 200 units back in 1949, this constituted a sizeable investment in diesel power, and that year a special committee was appointed to study the entire problem of protecting this investment from loss by fire.

Formerly fire protection consisted of a 1-qt carbon tetrachloride (CTC) extinguisher in the control cab, and two 1-gal CTC units, plus a 2½-gal foam extinguisher in the engine room. This protection was regarded by the committee as inadequate. The extent of its inadequacy was driven home in full force between November 1943 and May 1945, when Coast Line suffered three serious diesel fire losses, none the result of a wreck, to the tune of $92,000.

The fire committee after its study, recommended the installation of 77-gal stationary mechanical foam tanks on all passenger units (both "A" and "B"). Four years later, the committee again took up its work and sought to determine whether more modern methods of controlling diesel locomotive fires had been developed.

After conducting extensive tests with various makes of carbon dioxide and dry chemical extinguishers, the committee decided to change to Ansul dry chemical, due to the expense of maintaining CTC extinguishers and also since dry chemical had complete underwriters approval.

Before adopting the new units, ACL's Insurance Department made additional tests to check the effectiveness of dry chemical on actual burning electrical equipment and on diesel locomotives operating in high-speed service.

To determine whether the dry chemical was abrasive when used on electrical equipment, the engineering department conducted tests which consisted of saturating a 10-hp AC electric motor with gasoline and lubricating oil and igniting it. The motor was permitted to burn for a few moments while still running; then it was extinguished with dry chemical.

The same procedure was repeated four times. The report said, although motor was completely doused with the chemical, it continued to operate for the next 48 hours.

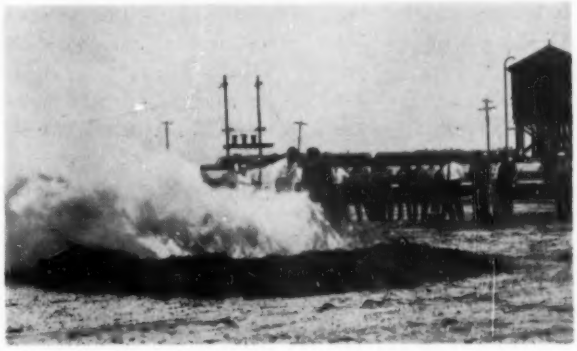
"When we tore the motor down and tested the parts," related Mr. Kooser, "we found that the dry chemical in the motor had acted more as a lubricant than as an abrasive."

Since then, Mr. Kooser says, reports of actual extinguishments while trains were in operation support the belief that dry chemical is not abrasive.

Full dieselization of the road's locomotive power has resulted in many changes in the fire protection program. While many fire hazards have increased, others have lessened. Most important, is the fact that ACL personnel is now better trained and has better equipment, and, top management, having become fully aware of the dangers of fire, is now throwing its full weight behind the fire protection program.

Training Program—Far Reaching

To forestall any such calamity, ACL has developed an



During fire training classes, employees are shown the proper technique in the use of dry chemical fire equipment.

ACL's Chief Fire Prevention Engineer, R. G. Kooser inspects a 77-gal pre-mixed foam tank which serves as a stand-by on a diesel locomotive unit.

Fire safety regulations on the Coast Line require a 30-lb dry chemical fire extinguisher as a stand-by whenever diesels are being refueled.

Employees of ACL's Florence, S. C., yards are taught the fundamentals of fire extinguishment in this fire training class.

intensive program of fire education and training that embraces every employee. This program is administered by Mr. Kooser, under the overall supervision of Robert Scott, Director of Safety and Insurance, and V. J. Mathias, Superintendent of Insurance. Mr. Kooser is assisted by H. G. Hubbard, Chief Clerk, and Jack Frost, Supervisor of Fire Prevention.

Basis of ACL's program is that of good housekeeping practices, cleanliness and neatness around all fire hazards. To drive home the importance of this point, ACL's slogan, "A Clean Place Seldom Burns," is displayed throughout the system—in repair shops, on bulletin boards and near dangerous hazards. Educational work is accomplished by means of fire safety posters provided by the National Fire Protection Association and the Association of American Railroads.

Second in importance is the organization and training of fire brigades in shops and repair facilities. Each shift has its brigade, so that fire protection is provided on a 24-hour basis. All hazards must be inspected weekly by brigade chiefs and their assistants, and these are subject at any time to spot checks by Kooser and Frost.

Fire schools are held at least once a year to train all new employees in the use of all types of extinguishers. Older employees are also required to attend, to participate in a refresher course. Fire training is, of course, an important part of the instruction provided on the company's diesel instruction car.

An important part of ACL's fire protection program is the maintenance of close relationships with the communities served by the railroad. Each year, Kooser and his assistants visit every town (782 served) on the Coast Line system, conferring with municipal fire chiefs and explaining the problems of railroad fire protection.

This careful attention to the municipal fire protection forces has paid off a number of times, when the volunteers have answered calls in the road's diesel shops or along the right-of-way. Municipal fire chiefs and their men also are invited to attend fire schools conducted regularly at local diesel repair shops and other installations.

Personnel Training

"First thing we do," says Mr. Kooser, "is to eliminate some of the men's natural fear of working with chemicals. To prove that dry chemical is harmless, we publicly taste and swallow some of the dry powder. When they see that we don't keel over dead, half of our job is done."

Next, the men are taught that they are more important than machines. They are shown how they can create a shield against the heat by spraying dry chemical into the air in front of them. This absorbs most of the heat so effectively that anyone can break out of a circle of fire in case he finds himself trapped, they are told.

As for the actual technique of fighting fire with the dry chemical, the men are taught to direct the chemical stream towards the forward edge of the flames and sweep it back toward the source with a rapid side-to-side motion. This creates a blanket of dry chemical over the burning area, and the fire goes out.

Since fires in flammable liquids sometimes re-flash, Coast Liners are taught never to turn their backs on a fire, even after it is extinguished, but to back away from it. Thus, they can handle a re-flash in case it occurs.

Because stumbling near a fire may prove fatal, trainees are also taught to study the terrain on which they are operating. The location of extra fire extinguishers is another "must" on the list of things to know.

Summary

All these add up to an all-around fire protection program that has paid big dividends for the Atlantic Coast Line Railroad. As a result, it has had lower fire losses and therefore more favorable insurance rates.

Diesel Beats Hazel

Hurricane Hazel represents only one type of threat to vital power supply, and radio communication is vital should disaster come. Westinghouse's Radio Station KYW, alert to this, stayed on the air with emergency diesel power when normal power failed.

ON Friday night, October 15, 1954, beginning before 6:00 pm, winds of hurricane strength struck the Philadelphia, Pa. area. Sustained velocities of from 50 to 80 mph and gusts up to 96 mph were recorded. Literally hundreds if not thousands of wires, both power and telephone, were downed by the wind, falling trees, poles, and other flying debris.

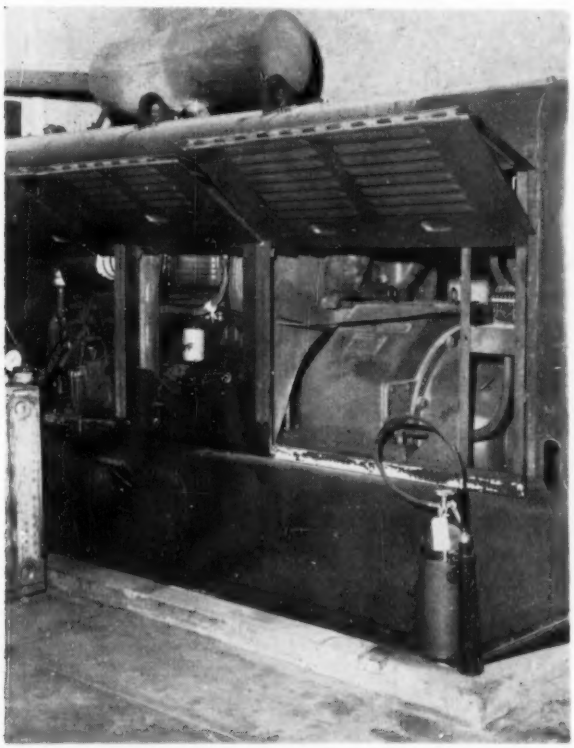
KYW's transmitter is located in Whitemarsh township, about 15 miles north of downtown Philadelphia. Normally this station is operated by current from one of two Philadelphia Electric Co. lines, each from a different substation. After some fluctuation of power on each of the two lines, they were both down and dead at 5:55 pm. Switching to the diesel-electric emergency source resulted in only 40 seconds "off the air", according to the KYW log. The station was then operated on diesel-electric power until 12:19 pm, October 16, 1954, when central station power was restored.

The standby unit consists of a 6-cyl Hercules diesel engine, Model DNX, direct-connected to a 105-kva, 3-phase, 60-cycle, 4-wire 220/440-v AC generator, and suitable controls. Starting of the engine is accomplished by a DC motor operated by current supplied by storage batteries. The set was purchased and installed in December 1947.

To insure its serviceability, the engine-generator set is inspected and operated for at least 1 hr per week. At this time the unit is placed under station load, usually during the night or on a weekend. This test operation is recorded in the station log. In addition, whenever a storm is brewing and seems to be approaching the area, the diesel engine is started and the set made ready to take over the station load if central power should fail.

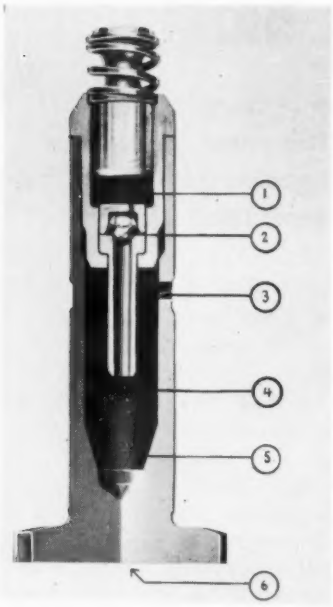
Similar diesel-electric sets have also been installed to insure the uninterrupted operation of other Westinghouse Broadcasting Co. stations: WBZ at Boston, Mass., KDKA at Pittsburgh, Pa., WOWO at Fort Wayne, Ind., and KEX at Portland, Ore.

This installation is typical of many more where diesels are protecting hospitals, frozen food plants, hotels, airports, telephone exchanges, and dozens of others, from local power failures.



Above, transmitter technician Harry Simpson demonstrates switching over from Philadelphia Electric power line (right switch in down position) to KYW diesel generator (left hand switch in up position).

At left, the Hercules powered, 105 kva diesel generator set installed at KYW.



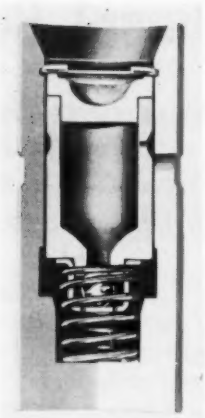


Fig. 1 Removeable Unit Type (left)
1. High compression chamber
2. Check valve assembly
3. Oil from engine pump
4. Sump or oil supply chamber
5. Body
6. Lifter face
Fig. 2 (above) illustrates the Integral Type.

Servicing Hydraulic Valve Lifters

By Gerald D. Line, Assistant Chief Engineer
Saginaw Division, Eaton Manufacturing Co.

Eaton's first hydraulic valve lifter was produced in the early '30s to give quieter valve gear operation. Today, constant valve timing regardless of engine temperatures and speed is an added function. For proper maintenance, operation of these units as well as servicing must be understood.

ACTUALLY, the hydraulic lifter is a fairly simple positive-action device. It will continue to deliver trouble-free performance under all normal engine operating conditions. The ability of the hydraulic lifter to maintain constant lash has reduced maintenance required by adjustable tappets, a high-cost item particularly on heavy-duty engines.

All hydraulic lifters used in today's engines are made up with various arrangements of the body (cylinder), plunger, plunger spring, and check valve assembly. Basically however, there are two lifter types—the removable unit type and the integral type.

REMOVABLE UNIT TYPE—(Fig. 1), is made up of a body and separate hydraulic unit. This allows the hydraulic unit to be removed from the body for servicing. Also, in case of damage, it is necessary to replace only the hydraulic unit unless the body face is worn. This separate body also serves as a sump or oil supply cham-

ber and acts as a settling chamber permitting large dirt particles to separate from the oil before reaching the unit.

INTEGRAL TYPE—(Fig. 2), is the integral ball check design and is usually confined to the barrel-type body. This lifter has come into prominence in the past few years because it has a minimum of parts, thus lending itself to low initial cost. Note that the plunger operates directly in the body, which necessitates discarding the whole assembly in case of damaged plunger or body. Oil may be fed into the hollow plunger by two different methods: from the push rod down through the socket, or by oil holes and grooves located in the side of the plunger and body which is connected to the oil galley.

There are other integral barrel lifters in use which differ mainly in check valve design. These will be shown under servicing.

How They Work

REMOVABLE TYPE—Engine lube oil is fed through the tappet guide to a supply chamber in the lifter body from which it can flow directly through the tube, past the check ball, and into the compression space between the bottom of the cylinder and the plunger. When the engine is started, oil pressure is built up in the system, filling the supply chamber.

With the lifter on the base circle of the cam and the engine valve seated, the light plunger spring moves the plunger outwardly to remove all lash from the valve gear. As the plunger moves outward, increasing the compression chamber volume, the ball check moves off its seat and the chamber is supplied with oil. As the camshaft rotates, lifting body upward, a pressure is immediately built up in the compression chamber, forcing the ball check onto its seat.

Further camshaft rotation, lifting the valve gear against increasing valve spring pressure, increases compression chamber oil pressure, thus acting as a solid member of the valve operating mechanism. As long as the valve is off its seat, the load is carried by this column of oil.

During initial engine operation, some air might remain in the compression chamber, which under pressure tends to leak through the clearance between plunger and cylinder, decreasing compression space volume. However when the lifter is again on the base circle of the cam, the plunger moves outward drawing in more oil so that after a number of cycles, the air is completely eliminated and a solid column of oil maintained in the space.

During this period when some air is present in the compression space, valve gear may be somewhat noisy since with aerated oil, it has the same effect as excessive lash. However, once the unit is completely cleared of air, it becomes a true hydraulic system.

COMPENSATING FOR VALVE GEAR LENGTH CHANGES—Compensation required for variations in cam-to-valve-seat length is accomplished by the original plunger-to-cylinder bore fit. These parts are selectively fitted to give a predetermined slight oil leakage (called leak-down) under load. This permits the valve to seat irrespective of the change in length between cam and valve seat.

If the valve gear is expanding, reducing distance between cam and valve seat, the valve spring load on the lifter causes the slight leakage mentioned, reducing the clearance volume and therefore the overall lifter length. When length increases, as caused by lower engine temperatures, the plunger spring keeps all the valve gear parts in contact, increasing the clearance volume under the plunger.

At the same time oil is immediately fed past the check valve, maintaining correct length under all conditions. This keeps the valve gear operating at zero-lash. With predetermined leakage it is impossible for the zero-lash lifter to hold the engine valve open when it should be closed.

When the lifter body is on the cam base circle and the engine valve is closed, the only force tending to hold the valve open is from the light plunger spring which obviously is much lower than the valve spring load. The only additional force tending to push the plunger upward results from lube oil pressure, but its effect is negligible since it is controlled and only acts on the small plunger area.

During engine shutdown period, one or more valves are always in the lifted position, thus imposing the full valve spring load on the plunger. This causes the oil to leak out of the compression chamber through the clearance space until the plunger bottoms in the cylinder. When the engine is again started, the particular valve that was in the open position returns to its seat and the plunger is immediately forced upward by its spring. Oil from the supply chamber is again fed into the clearance volume under the plunger so that in a very few cycles the valve gear is operating on a solid hydraulic oil column.

INTEGRAL TYPE—This lifter operation is essentially the same as that for the removable type. Oil supplied to the hollow plunger feeds down through the check valve which admits the exact amount of oil lost due to leak-down for each lift cycle, keeping the high compression space replenished.

When to Service

Hydraulic valve lifters should be serviced

1. When they are definitely noisy.

A lifter not functioning properly may cause a loud clacking, light clicking, or intermittent noise.

Loud clacking is the result of excessive lash and indicates:

a. the plunger is stuck below its normal operating position, probably plunger bottomed, and must be disassembled and cleaned of dirt and varnish.

b. the check valve may not be sealing due to dirt or damaged seat which again necessitates cleaning and inspection.:

c. oil may contain sufficient air (which is compressible) to permit collapse or partial plunger movement beyond its normal operating position. Servicing will not help. It is necessary to correct the cause of aeration.

Light or clicking type noise indicates that the plunger is operating only slightly below its normal position as the result of:

a. slight leakage by the check valve or plunger. If the noise is persistent, lifter must be removed, cleaned, and checked.

b. small amount of air in oil which can only be helped by eliminating the aeration.

Note: Slight clicking may be caused by engine parts other than lifters, (see Caution).

Caution

Even when lifters are working correctly there are other noises in an engine which are often "blamed" on lifters and can usually be identified as a slight clicking noise. These may be caused by valve stem guide clearance, worn timing chains or gears, piston slap, lifter body guide clearance, worn lifter face or cams, loose main or rod bearings, worn rocker arms, ignition knock, worn valve tips, or incorrect mechanical lash adjustment.

Intermittent noise is the result of:

a. metal chips or dirt. Occasionally such material becomes lodged between check valve and seat. Cleaning will correct this condition.

b. slight plunger sticking caused by dirt or varnish-like substances, necessitating cleaning and eliminating the source of varnish.

Dirt, chips, varnish, etc., generally cause only a few units to become inoperative at any one time. Aeration caused by high or low oil level, air leaks into the oil pump suction line, etc., result in all lifters becoming noisy. The aeration cause must be corrected before lifters will again operate quietly.

Small metal chips lodging between plunger and cylinder tend to prevent free movement. Since loads during lift portion of the cycle are relatively high, the plunger is forced downward and the very light plunger spring has insufficient force to move the plunger back to normal operating position. After a few lift cycles, the plunger finally reaches a position (usually plunger bottomed) where there is excessive lash with resultant noisy operation.

The type of varnish resulting from a mixture of permanent anti-freeze and oil is very "tacky" and particularly when cold will prevent free plunger movement. The resulting action is the same as that caused by a chip in the clearance space. The entire engine must be cleaned and cause of leakage corrected.

Varnishes resulting from fuels and lubricants, unless excessive amounts are created by poor crankcase ventilation or extremely bad lubricants, seldom cause sticking in the Eaton-design lifter. This freedom from sticking caused by varnish conditions, is the result of careful study and the design of proper varnish grooves. However, if such deposits do form and cause trouble, then it is necessary to correct crankcase ventilation, lubricant, or fuel.

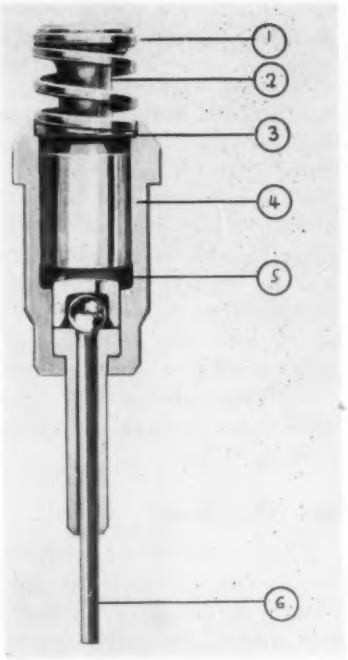


Fig. 3
1. Plunger spring
2. Plunger
3. Carbon deposit
4. Cylinder
5. Oil
6. Round end pin

2. When engine is overhauled.

Lifters will need to be removed and normal varnish deposits cleaned off whenever a change has been made increasing cam-to-valve-tip distance. This may cause the plunger to be forced into a varnish deposit accumulated above original plunger travel. Since the plunger previously had not been required to operate in this position, the lifter must be removed and cleaned of all varnish deposits so the plunger can move freely.

The following will cause increased valve train length.

a. grinding valve tips.

b. valve train parts not put back in their respective locations.

c. installing new parts.

d. changing adjustment of rocker arm adjusting screw.

Even when doing a valve grind job it may not be necessary to disturb the lifters. However it may be found occasionally that worn valve tips will need to be ground to give a smooth surface. In this case, the cam-to-valve-tip length would be increased necessitating lifter cleaning as mentioned.

Servicing

Following is the service procedure to be followed in servicing hydraulic lifters of all designs.

1. Immerse unit in solvent to remove excess engine oil and soften varnish deposits.

2. To avoid mixing plungers and cylinders, take apart one lifter at a time and complete all servicing before working on another. However if racks are available for keeping plungers and cylinders together, then all lifters may be disassembled at the same time.

3. Wash all parts in solvent and clean all varnish from plunger and inside diameter of cylinder.

4. Inspect plunger and cylinder walls for scratches. Look for nicks on valve seat and examine condition of lifter face. Check for plugged oil holes.

5. Try plunger for free fit in cylinder.

6. Reassemble all parts in proper sequence. (See photographs of different types.)

7. Check leakdown with suitable fixtures when these are available.

Fig. 4 Stuck plungers may be removed from the body by tapping the assembly gently against some resiliant surface such as masonite.

REMOVABLE UNIT—Remove the plunger from the cylinder, first disengaging the plunger spring by simply twisting the plunger and spring in the direction that winds up the spring. Pull outward at the same time and the plunger should come out easily. Arrange the plunger and cylinder after disassembly so there will be no chance of the parts of one unit being mixed with parts of another. As stated before, the plunger and cylinder are mated. Every lifter has the correct leakage rate as it leaves the factory. The plunger and cylinder are selectively fitted and the plunger from one cylinder cannot be used in any other cylinder.

In some engines where the lifters have operated for a long period of time, some difficulty may be encountered when attempting to remove the plunger from the cylinder. This is caused by a carbon ring which builds up above the plunger and below the plunger spring. (See Fig. 3). In fact, this condition may lead one to believe that the plunger is stuck since it cannot be pulled out easily and cannot be forced down. This unit should not be discarded because in most cases the condition is due to carbon deposit above the plunger, and with oil in the compression chamber, the plunger cannot be forced downward.

To determine whether or not the plunger actually is stuck, insert a round end pin in the oil inlet in the bottom of the cylinder. This will release the check valve and allow the oil to drain out when the plunger is pushed down. The plunger should now move freely in the cylinder, which indicates that the plunger is not stuck but is held in the cylinder by carbon deposit.

By the use of taped pliers and a combination of twisting and pulling motion as mentioned above, usually the plunger and cylinder can be separated. With this done, clean them thoroughly in clean solvent. Be sure each unit is washed separately. No attempt should be made to remove the check ball assembly from this unit as it is a press fit in the cylinder. Cleaning should be done in such a manner that will allow the solution to pass back and forth through the check ball assembly.

LEAKDOWN CHECK—When washed thoroughly, determine whether the leakage past plunger and cylinder is correct and whether or not the check valve is functioning satisfactorily. There are fixtures on the market available for checking leakdown rate. If these are used, instructions which accompany them should be followed.

If fixtures are not available, a very simple finger check can be used which for most purposes is satisfactory. This check should be made immediately after washing in solvent to make sure there is no oil on the cylinder or plunger. With the cylinder held in one hand, start the plunger into the cylinder with the other. Depress the plunger with finger and release quickly. Since the plunger now is operating against air instead of oil, air is sealed in by the ball check valve and the close cylinder-to-plunger fit. It should yield slightly to the pressure of the finger on the plunger, but the plunger should kick back upon release.

If no kick-back of plunger occurs, the unit may or may not be defective. Lack of kick-back is due to one of three conditions. First, air is escaping past the check valve due to dirt preventing proper ball seating. Second, air is escaping past the check valve due to a damaged ball seat. Third, air is escaping because the plunger-to-cylinder wall clearance is too great, indicating excessive leakdown.

To determine whether or not the condition is due to a faulty check valve, place a finger over the oil inlet, repeating press and release process. If plunger kicks back properly, it's the check valve.

Rewash the unit to eliminate any dirt which might still be on the check ball seat and repeat the test without holding a finger over the inlet hole. If there is still no kick-back, then the check valve is damaged and the entire unit consisting of cylinder and plunger should be discarded. No plunger kick-back even with the finger

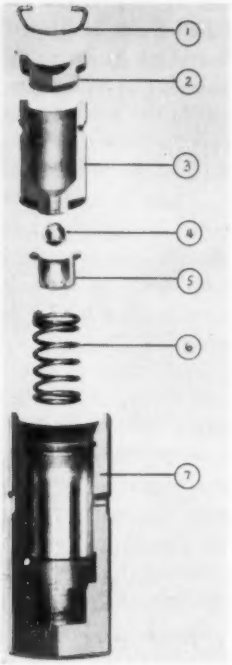


Fig. 5 Integral ball check lifter
1. Snap ring
2. Socket
3. Plunger
4. Check ball
5. Retainer
6. Plunger spring
7. Body

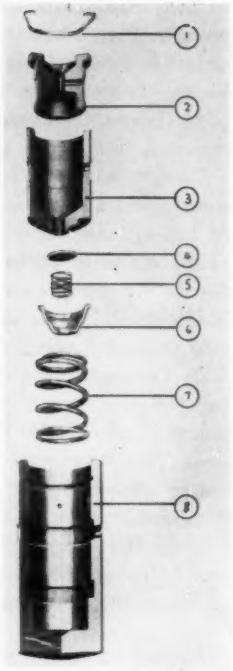


Fig. 6 Integral flat check valve lifter (coil spring type)
1. Snap ring
2. Socket
3. Plunger
4. Flat check valve
5. Check valve coil spring
6. Retainer
7. Plunger spring
8. Body

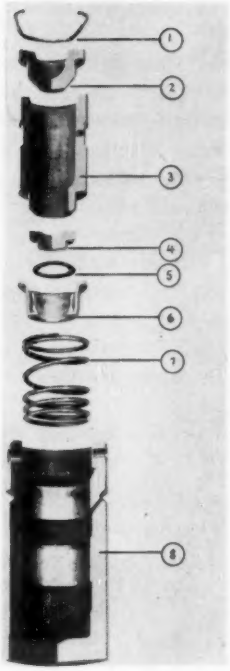


Fig. 7 Integral flat check valve lifter (wave spring type)
1. Snap ring
2. Socket
3. Plunger
4. Check valve
5. Wave spring
6. Retainer
7. Plunger spring
8. Body

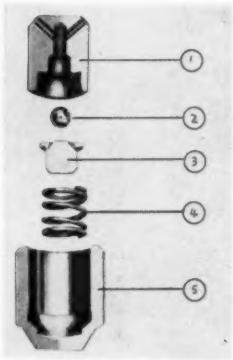


Fig. 8 Stub type
1. Plunger
2. Check ball
3. Retainer
4. Plunger spring
5. Body

held over the oil inlet hole indicates too much leakage between plunger and cylinder. In this case also the entire unit must be discarded.

In the above test procedure it is important that the pressure on plunger be released immediately after it is depressed. Naturally if the plunger is held down too long all of the air trapped under the plunger will leak out and the test would mean nothing.

If it is found by the test that the unit is satisfactory, then the plunger should be inserted in the cylinder. Push down on the plunger so the spring can be engaged in the counterbore of the cylinder by twisting the cylinder and plunger in the direction that winds up the spring. The unit is now ready for reinstallation.

INTEGRAL BALL CHECK LIFTER—In disassembling integral lifters, first remove the snap ring located on the inside top of the assembly. Extreme caution should be used in order that the circlip does not "pop out" and be lost. Removal of this clip should allow the separate socket to be readily removed. By shaking the assembly gently, the plunger should also come out unless it is held by carbon and varnish deposits. If this is the case, some force will be required in order to remove the plunger from the body. Special tools are available that may be inserted in the plunger to facilitate this removal. Instructions accompanying these tools should be followed closely. If no tools are available, then it may be necessary to hold the assembly upside down (Fig. 4), and bump the open end gently against some resilient surface (e.g. masonite). Care should be taken so the plunger or body will not be damaged.

When removing the plunger from the body, use caution as the check ball and retainer can now fall away from the seat and become lost. It is best to perform this disassembly over the pan of cleaning solution so that the parts will fall into the fluid. With all parts now disassembled, follow the servicing procedure outlined above.

If inspection shows no defects, all parts can now be reassembled in their respective positions, (Fig. 6).

Special tools are also available to the field for checking leakdown of integral lifters and again instructions accompanying these fixtures should be followed closely.

INTEGRAL FLAT CHECK VALVE LIFTER (COIL SPRING TYPE)—After removing plunger, the check valve assem-

bly may be found to be loose on the plunger. Care should be used so that the small flat check valve and coil spring are not lost. If the check valve assembly stays attached to the plunger, it would be best to leave them in this position unless necessary to disassemble for inspection. Wash all parts thoroughly and reassemble as shown in Fig. 6.

INTEGRAL FLAT CHECK VALVE LIFTER (WAVE SPRING TYPE)—This design has a flat valve in combination with a "wave spring". The flat valve must be assembled in the position shown in Fig. 7, otherwise the lifter will not function properly.

STUB TYPE—This unit will be found in heavy-duty diesel engines and is to be serviced in the same manner as other integral lifters. The plunger can be removed by inserting a wire in the two holes in top of the plunger. Then twist and pull outward at the same time. Assembly procedure is shown in Fig. 8.

Leakage past plunger and cylinder and condition of check valve can be checked on this unit in a manner similar to that outlined for the removable unit. However in this case, the plunger should be held with the oil inlet holes down. After placing the check ball and retainer in position, the cylinder is placed over the plunger. Press

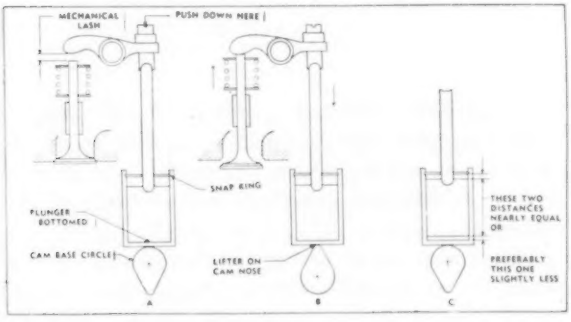


Fig. 9

down on cylinder and release quickly to check leakdown. (See leakdown checking for removable unit.)

Initial Adjustment

WHAT IS MECHANICAL LASH?—It is the clearance which the valve gear would operate with if there were no oil in the high compression chamber of the lifter. This can be measured at the valve tip with the lifter plunger completely bottomed and lifter on cam base circle. (Fig. 9A) This lash is completely taken up when the lifter is functioning normally.

MECHANICAL LASH REQUIRED—The amount of mechanical lash required may vary with different makes of engines depending on rocker arm ratios, lifter design, etc. Engine manufacturers' recommendations should be followed closely. Tests have shown however that lifters will require less quieting time if the lash is adjusted so that the plunger will operate in the middle of its travel or preferably, slightly less as shown in Fig. 9C.

CHECKING MECHANICAL LASH—After installing lifters and before starting engine, check the mechanical lash as follows:

1. Make sure lifter is on base circle of cam.
2. Force plunger to its bottomed position (no oil remaining in compression space).
3. Check lash between valve tip and rocker arm (overhead valve engine).

If reinstalled lifters have not been refilled with oil then plungers can be forced to their bottomed position easily. Where lifters have not been removed for servicing and it is desired to check the mechanical lash, some oil will be present in the compression space. A steady force applied to the plunger for several minutes to allow the lifter to leakdown, will be necessary. One method of accomplishing this on overhead valve engines is as follows:

1. Turn engine until lifter is on cam nose and let stand several minutes. Valve spring load will force plunger downward. See Fig. 9B.
2. While pushing down on pushrod end of rocker arm (this will keep plunger spring from moving plunger outwardly), turn engine until lifter is again on cam base circle (valve closed).
3. Measure lash while still pushing down on pushrod. See Fig. 9A.

HOW TO SET LASH—On valve gears equipped with adjusting screws, the lash can be adjusted as follows:

1. Back off adjusting screw until pushrod side play is considerable at adjusting screw socket.
2. Then turn screw downward until pushrod side play just disappears. At this point the lifter plunger is in its fully extended position and all valve train parts barely contacting each other.
3. Continue turning screw downward (see engine manual for required number), until plunger reaches its mid-position or preferably slightly less.

Note: The above lash adjustment requires that the plunger is in its fully extended position (against the snap ring). It is recommended that this adjustment be done only after lifters have been completely serviced and cleaned.

On engines not equipped with adjusting screws, any increase in lash can be accomplished by grinding the valve tip. However in these valve trains it will probably not be necessary to change the lash especially if all parts have been returned to their respective positions during engine reassembly.

Starting the Engine

When lifters have been reinstalled without prefilling with oil, the valve gear will be extremely noisy for several minutes. During this period the engine should be run at a fast idle to provide maximum opportunity for air to work out of lifters and oil galleys. Lifters will function efficiently only when they are operating on a solid oil column.

Multiple-Effect Unit Treats Water

Water can harm cooling systems in several ways. Also, there are many types of water. Selection of suitable treatment may be an involved process — or you can safely rely on a "package" treatment.

JOE Miller probably told it first. A scholar with an analytical turn of mind woke up with a hangover after a bout with scotch and water. He decided to pursue his investigation night after night using different alcoholic beverages mixed with water. Morning after morning the results were the same. Since the only ingredient common to all the tests was the water, he concluded that it must be to blame.

If he had been testing engine cooling systems instead of his constitution, his logic might have more validity. That nice clear water might not be so innocent as it appears and may be the cause of a lot of headaches. It can do a lot more damage to the cooling system than would probably be done by the liquor.

Water characteristics vary in different locations. It stands to reason. Water will dissolve many substances with which it may come in contact and will take them into solution. In certain areas, it will pick up mineral salts and become hard and/or alkaline. Exposed to rotten vegetation as in the swamps, it may remain soft but will probably become acidic.

These conditions alone or in combination will affect the cooling system adversely. Deposits and scale are common results of hard water. Corrosion results from either excessive acidity or alkalinity. Even if distilled water is used in a system, oxidation or rust will take place, particularly if oxygen is present in the system.

It becomes pretty clear that several different types of treatment are necessary for best results. The simple use of chemical rust inhibitors or soluble oil are not necessarily a complete answer. Yet it is important to the life of the engine and its components that the cooling system be kept at maximum cleanliness and protected against corrosion.

The average engine operator can't take the time and trouble to go through elaborate tests to find out the specific type of treatment necessary for the water that he is using. Then take the case of the trucker who may fill his radiator whenever and wherever water is needed. This emphasizes the value of a "package" to handle the whole job.

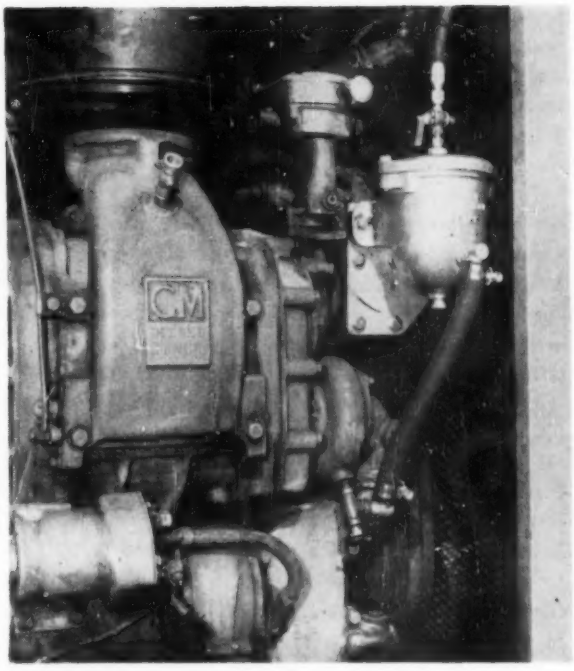
Apparently, Detroit Diesel Engine Division, GM, thought that this was a good idea when they adopted the Perry cooling system filter and conditioner as a standard accessory on all Series 71 and 110 engines in marine propulsion service. It is an optional accessory on these same engines in other service and on the Series 51 engines in all services including marine.

A Look at the "Package"

The Perry filter-conditioner is a simple unit from the user's viewpoint although operationally it has complex functions. Built in sizes suitable for different coolant capacities, it is a light, compact unit, easily serviced with replaceable elements.

Major troubles occurring in cooling systems have been discussed but now can be tied in with the operation of the Perry unit. One feature not mentioned concerns fil-

Cutaway of filter-conditioner exposing the resistor plates, the chemical element and filter unit, and indicating flow.



Filter-conditioner cccessibly mounted. Resistor plates are grounded through the housing and bracket to the engine.

tration. Sediment, rust particles, and loose scale may appear in the coolant, particularly when the unit is installed on an engine that lacked protection in the past. It is important to trap this foreign material so that it does not settle in low spots in the cooling passages or block radiator tubes.

Active ingredients in the cartridge element provide for mineral softening of the water. This minimizes scale formation and similar deposits. Another chemical reaction controls the relative acidity or alkalinity of the water.

This is generally expressed as a pH value. Using an arbitrary scale from 1 to 14, the neutral solution is rated 7. Below 7, water is acidic in nature and is conducive to iron and steel corrosion. The alkalinity range is above 7 and while high alkalinity may not bother the ferrous metals, it promotes corrosion of the non-ferrous metals in the system.

Therefore pH control is important. It is generally desired to keep the solution on the alkaline side and the range between 8.5 and 9.5 appears to give the best all-around results.

Inhibition to prevent oxidation or rusting is still another chemical action. The idea is to get a microscopic coating on the metal that will protect it while not interfering with heat transfer.

Finally, there is the matter of protection against galvanic action. Sacrificial or resistor plates are incorporated in the element to give electro-chemical protection. The action is similar in effect to the use of zinc pencils or plugs which are sacrificed in place of component metals in cases of galvanic corrosion.

Installation and Service

Installation of the filter-conditioner is a simple matter but there are a few things to be observed if the unit is to function properly. First, it should be mounted in an upright position and made accessible for servicing.

The filter assembly must be effectively grounded to the engine for proper action of the resistor plates. These plates are grounded to the housing so all that is needed is the removal of all dirt, paint, and grease at the points of support.

Heavy-duty heater hose is adequate for connecting the unit to the cooling system. The inlet hose should be as short as possible and with minimum restriction so that the flow will divert pitting or corrosive action from the system's components to the resistor plates. The outlet hose may be as long as necessary, but if long should be supported by clips.

Adequate flow through the unit is important. Being of the bypass-type, the inlet hose must be connected to the system where the pressure is high. The outlet is connected at a low pressure point. Shutoff valves can be used to isolate the unit for servicing while the engine is operating but should be of a type offering minimum restriction when open.

Service life of the elements will be affected by the

system's water capacity and the amount of make-up water needed. Up to 40% make-up water can be safely added between element changes. The treated water will be amber in color and this is the key to element changes. When the color fades it is an indication that the element should be replaced.

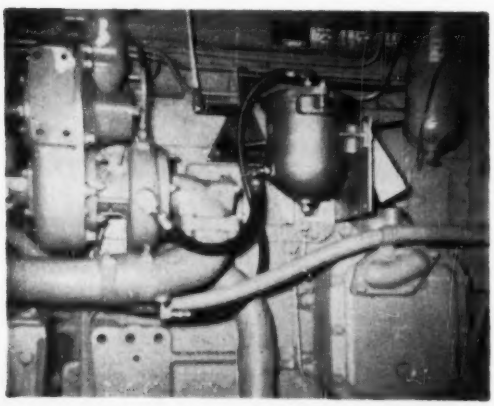
In this way, occasional color checks will determine the best change interval. However, one element should never be used for more than 500 operating hours. When a filter-conditioner is first installed, two or three initial element changes at about 150-hr intervals may be necessary while the system is being cleaned up. When conditions stabilize, normal intervals can be established.

If it becomes necessary to drain the cooling system for any reason before an element is due for a change, the treated water can be saved and reused. Otherwise a new element must be installed since this constitutes 100% make-up. The partially depleted element may not be able to cope with this volume.

Anti-freeze may be added to the coolant without any effect on either the anti-freeze or the filter-conditioner. In all field observations to date, incompatibility of the materials involved has not been evidenced. One beneficial effect has been that with anti-freezes having inhibitors present, the element change period can be safely extended to the 500-hr maximum figure.

Use of soluble oil in a system protected by the filter-conditioner is improper. The oil coats the resistor plates as it does the rest of the system surfaces. This prevents the electro-chemical action from taking place in the filter assembly.

Element replacement is a simple matter, and by the removal of the bottom drain plug filtered material can be flushed out. While the assembly is open, resistor plates should be wire-brushed to a bright finish. If badly pitted (showing that they are doing a job), they should be replaced.



One method of connection on a GM 110 engine. Inlet connects to pump scroll case for high pressure and discharges to lower pressure pump suction. Note similar arrangement in previous picture.

Summary

"Package" protection of the cooling system is only possible because of the multiple functions of this filter-conditioner unit. It permits great flexibility in the use of different waters without harm to the engine's cooling system by providing protection against all the major causes of trouble.

Proper installation and maintenance will give the unit a chance to do its best work in providing a cleaner cooling system. Better heat transfer will result in greater engine efficiency while prolonging the life of many engine components.

What Do You Know!

Here are some questions to test your general knowledge of the diesel field. Make your selections, then turn to Page 79 to check them.

1. Why is a manufacturer's recommended step-by-step procedure the best method of doing an engine tune-up?
   a. No steps will be skipped.
   b. Saves time.
   c. Accuracy of some adjustments will depend upon others being accurate.

2. International Harvester's twin plunger pump distributes fuel through distributor blocks. Since it is a distributor system, no balancing of the delivery to the cylinders is necessary.
   a. True b. False

3. I-H engines have provisions for starting as gasoline engines and then converting to diesel operation. Operation of the engine is possible.—
   a. as either a gasoline or diesel engine.
   b. on gasoline for short starting periods.
   c. on gasoline at reduced load but on diesel for full load operation.

4. When hydraulic valve lifters are used to maintain proper lash adjustment, lifters should be serviced—
   a. periodically.
   b. when the engine is overhauled.
   c. when they become noisy.

5. Hydraulic valve lifters will have to be serviced when which of the following conditions develop?
   a. Drop-off in engine oil pressure.
   b. Some condition (wear, loose adjustment screw, etc.) increasing lifter plunger travel.
   c. Loss of engine valve spring tension.

6. The pH value as applied to engine cooling water refers to which of the following qualities?
   a. Hardness c. Acidity
   b. Alkalinity d. Softness

7. All cooling system troubles relating to water can be solved by the use of distilled water.
   a. True b. False

8. One reason that dry-type chemical fire-fighting equipment is effective protection for diesel-electric locomotives is that it is non-abrasive.
   a. True b. False

I-H Engine Tune-Up

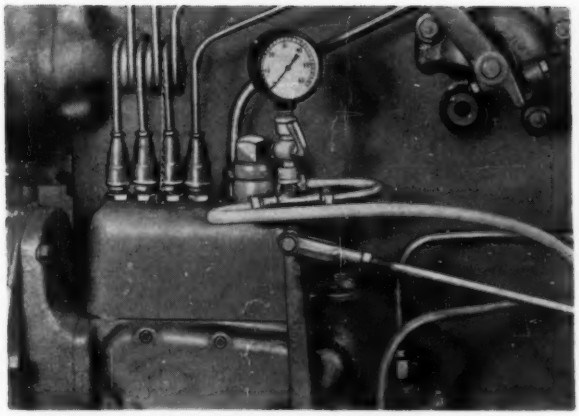


Fig. 1 Use 0 to 100-psi gauge and hook-up shown for engines not equipped with fuel pressure gauge.

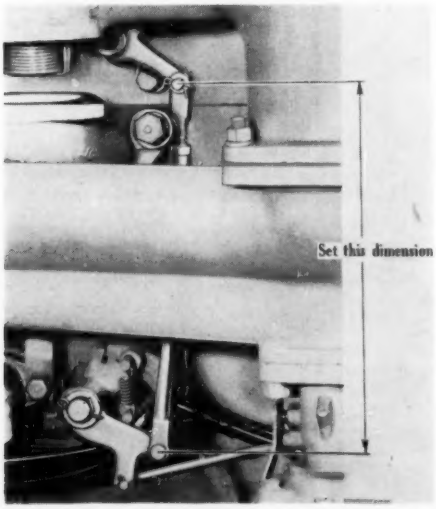


Fig. 2 (All Series) Adjust to following length.

Engine Series	Dimensions (inches)
6 and 6A	6-7/16
264	6-5/16
9 and 9A	6-29/32
14, 14A and 18A	9-7/16
18	9-9/32
16	6-25/32
24	8-1/2

Manufacturer's recommendations for the step-by-step tune-up of International Harvester diesels.

TO do the job right and save time and "backtracking", you should be familiar with the engine manufacturer's "tune-up" procedure. International Harvester recommends the following systematic method for checking over the engine and fuel injection system.

Fuel System

Step 1 Check primary fuel pressure. This should be 58 to 66 psi at engine speeds of 700 rpm and up. On engines not fitted with fuel pressure gauge, a 0-to 100-psi gauge with plastic tubing and fittings should be used as shown in Fig. 1.

Step 2 Check fuel filtering system. Be sure that fuel flows freely to primary pump inlet and that there are no air leaks. Check the following points consecutively: fuel supply valve at tank, strainer inlet and outlet, auxiliary fuel filter inlet and outlet, and primary fuel pump filter.

Step 3 Vent fuel system at strainer and auxiliary and final fuel filters consecutively.

Step 4 (Power Units Only) Check fuel transfer pump.

Step 5 Check air cleaner and connections between cleaner and manifold for possible leaks. Clean air cleaner oil cup and also the screen on the air intake cap.

Compression Release Mechanism and Valve Adjustment

Note: *Before making the following adjustments, the engine must be completely assembled except for the intake and exhaust manifolds, all rods and linkage should be lubricated, and controls in diesel position except where noted.*

Step 6 (with mechanism in diesel position) Adjust operating rod length (see Fig. 2).

Step 7 (16 and 24 Series Only) Adjust the starting valve cross shaft lever rod (see Fig. 3).

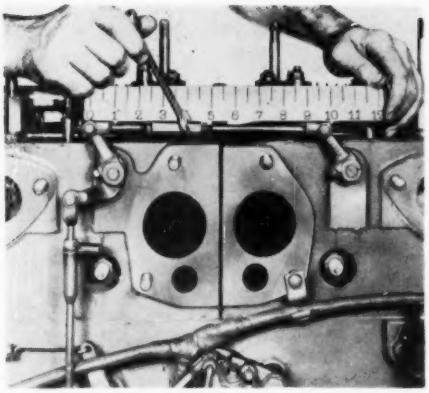


Fig. 3 (16 and 24 Series only) Adjust to following length.

Engine Series	*Dimensions (inches)*
16	7-1/4
24	9-23/32

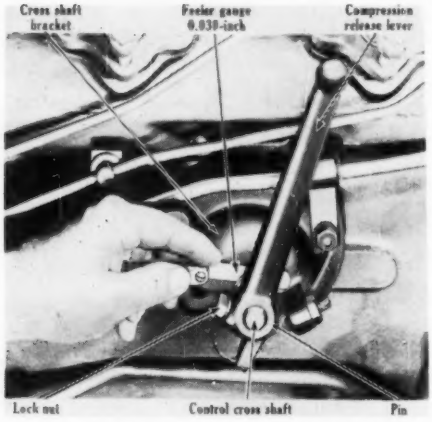


Fig. 4 Cross shaft end play should be 0.030-in.

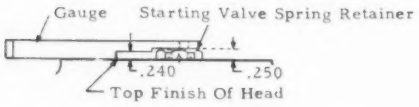


Fig. 5 Check starting valve spring retainer.

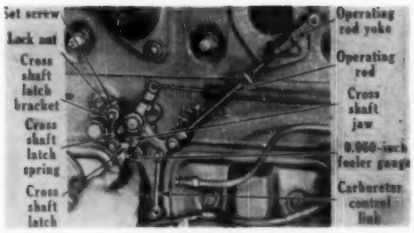


Fig. 6 Clearance between cross shaft latch and cross shaft jaw should be 0.060-in.

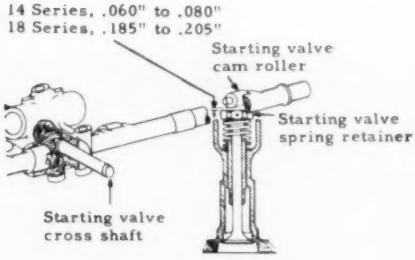

14 Series, .060" to .080"
18 Series, .185" to .205"
Starting valve cam roller
Starting valve spring retainer
Starting valve cross shaft

Fig. 7 (14 and 18 Series only) Starting valve shaft cam and starting valve cover adjustment.

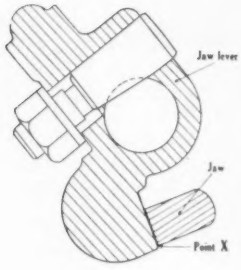


Fig. 8A

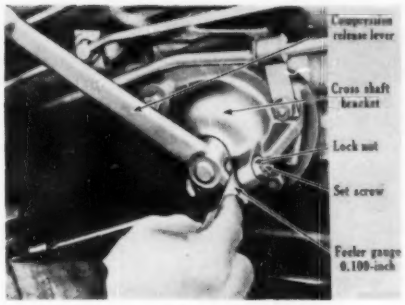
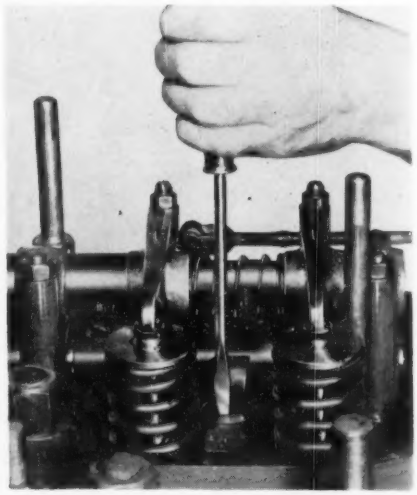


Fig. 8B

Fig. 9 Check starting valve cover travel.



Step 8 Adjust the cross shaft end play (Fig. 4).

Step 9 (18 Series Only) Check all six starting valve spring retainers as shown (Fig. 5).

Step 10 Check and adjust the clearance between cross shaft latch and cross shaft jaw (Fig. 6).

Step 11 (14 and 18 Series Only) Adjust the clearance between starting valve shaft cam (or cam roller) and starting valve cover (spring retainer) as shown in Fig. 7.

Step 12 With mechanism still in diesel position, turn cross shaft lever clockwise until jaw and jaw lever contact at point "X" (Fig. 8A). Then adjust clearance (0.100) between cross shaft release lever and cross shaft bracket set screw. (Fig. 8B).

Step 13 With controls in gasoline position, check starting valve cover travel as shown in Fig. 9. This should be about 1/64-in before bottoming in the cylinder head.

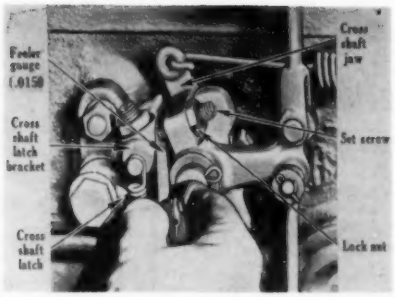


Fig. 10 Clearance between cross shaft jaw and latch bracket—0.015.

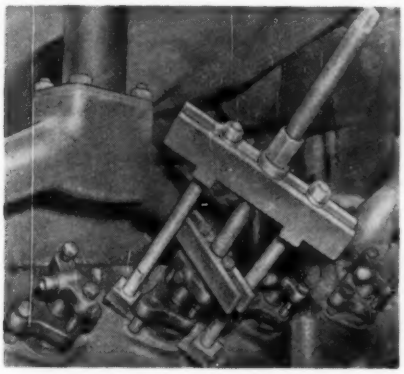


Fig. 11 Injection nozzle puller 1 020 284 R91.

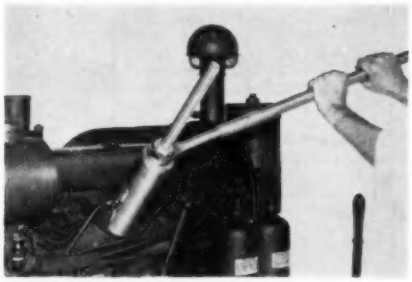
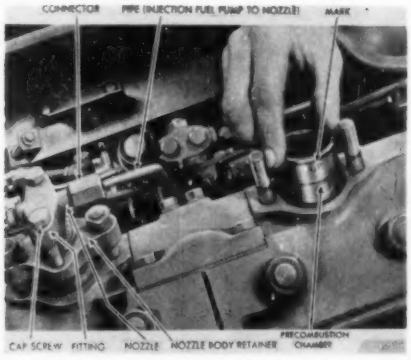


Fig. 12 Manual "Pre-Cup" puller 1 020 310 R91. A hydraulic unit is also available for use with this puller.

Fig. 13 Precombustion chamber removal.



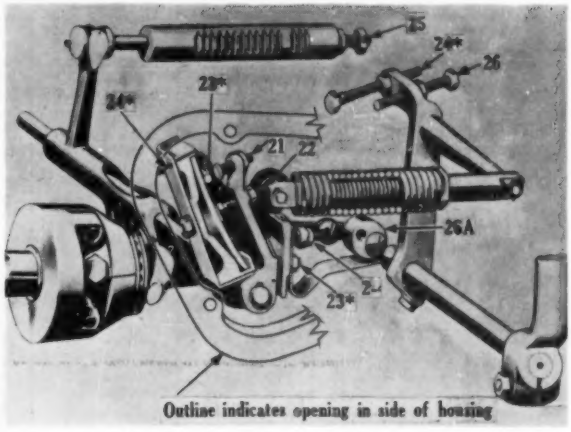


*Fig. 14 Points of adjustment and measurement. Numbers on illustration correspond with step numbers. Skeleton of governor for single-plunger pump is shown. *Steps 23 and 24 are each illustrated with two arrows—one arrow shows the point of adjustment and the other arrow shows where to make the measurement.*

Step 14 With controls in gasoline position, check and adjust the clearance (0.015) between the set screw in the cross shaft jaw and the latch bracket (Fig. 10).

Step 15 With controls still in the gasoline position, check to see that each starting valve cover has additional travel (refer to Step 13). If check shows no travel, controls should be rechecked for errors in adjustment.

Step 16 Switch controls to diesel position to determine if there is clearance between the starting valve shaft and valve covers.

Note: *Prior to installing manifolds, be sure that butterfly valves in intake manifold are in horizontal position. Butterfly valves must fit with not more than a* 0.0015*-in clearance, measured with a feeler gauge no wider than* $\frac{1}{8}$ *in.*

Step 17 Install manifolds and set intake and exhaust valves. See tune-up chart for clearances.

Injection Nozzle and Compression Check

Step 18 Check the compression of each cylinder on the diesel cycle. This is done by first removing No. 1 nozzle body from the cylinder head, inserting and securing the proper adapter, and attaching the indicator. Start the engine, switch to diesel, and bring rpm up to 1000. Check the indicator reading against compression pressure on "tune-up chart" and repeat the process for each cylinder.

Note: *Be sure the compression indicator is in working order and free of leaks.*

Step 19 Remove injection nozzles (Fig. 11) and check for leaks and popping pressure.

Step 20 Remove precombustion chambers and check for pitted and burned surfaces. See Figs. 12 & 13.

Model	Firing Order	High Idle Speed R.P.M.	Low Idle Speed R.P.M.	Gasoline Cycle (Starting) R.P.M.	Distributor Point Gap Inch	Magneto Point Gap Inch	Spark Plug Gap Inch
UD-6	1 - 3 - 4 - 2	1635 - 1695	450 - 550	900 - 1200	-	.013	.023
UD-6A	1 - 3 - 4 - 2	1745 - 1805	450 - 550	900 - 1200	-	.013	.023
IUD-6	1 - 3 - 4 - 2	1580 - 1640	450 - 550	900 - 1200	-	.013	.023
TD-6	1 - 3 - 4 - 2	1580 - 1640	450 - 550	900 - 1200	.020	.013	.023
ID-6	1 - 3 - 4 - 2	1580 - 1640	450 - 550	900 - 1200	-	.013	.023
UD-264	1 - 3 - 4 - 2	1715 - 1775	450 - 550	900 - 1200	.020	-	.023
UD-9	1 - 3 - 4 - 2	1635 - 1695	450 - 550	900 - 1200	-	.013	.023
UD-9A	1 - 3 - 4 - 2	1745 - 1805	450 - 550	900 - 1200	.020	.013	.023
TD-9	1 - 3 - 4 - 2	1525 - 1585	450 - 550	900 - 1200	.020	.013	.023
ID-9	1 - 3 - 4 - 2	1635 - 1695	450 - 550	900 - 1200	-	.013	.023
UD-14	1 - 3 - 4 - 2	1470 - 1530	450 - 550	900 - 1200	-	.013	.023
UD-14A	1 - 3 - 4 - 2	1525 - 1585	450 - 550	900 - 1200	-	.013	.023
TD-14	1 - 3 - 4 - 2	1470 - 1530	450 - 550	900 - 1200	-	.013	.023
TD-14A	1 - 3 - 4 - 2	1525 - 1585	450 - 550	900 - 1200	-	.013	.023
UD-16	1-5-3-6-2-4	1965 - 2035	450 - 550	900 - 1200	-	.020	.023
UD-18	1-5-3-6-2-4	1525 - 1585	450 - 550	900 - 1200	-	.020	.023
UD-18A	1-5-3-6-2-4	1745 - 1805	450 - 550	900 - 1200	-	.020	.023
TD-18	1-5-3-6-2-4	1415 - 1475	450 - 550	900 - 1200	-	.020	.023
TD-18A	1-5-3-6-2-4	1470 - 1530	450 - 550	900 - 1200	-	.020	.023
UD-24	1-5-3-6-2-4	1495 - 1555	450 - 550	900 - 1200	.020	-	.023
TD-24	1-5-3-6-2-4	1495 - 1555	450 - 550	900 - 1200	.020	-	.023

Tune-Up Charts

Model	Valve Clearance		Valve Timing				Nozzle Discharge Pressure		Compression Pressure at 1000 R.P.M. P.S.I.
	Hot Inch	Cold Inch	Intake Opens Degrees	Intake Closes Degrees	Exhaust Opens Degrees	Exhaust Closes Degrees	New Nozzle P.S.I.	Used Nozzle P.S.I.	
UD-6	.017	.019	10 before TDC	30 after BDC	43 before BDC	10 after TDC	740 - 750	700 - 710	442 - 488
UD-6A	.017	.019	10 before TDC	30 after BDC	43 before BDC	10 after TDC	740 - 750	700 - 710	556 - 614
IUD-6	.017	.019	10 before TDC	30 after BDC	43 before BDC	10 after TDC	740 - 750	700 - 710	442 - 488
TD-6	.017	.019	10 before TDC	30 after BDC	43 before BDC	10 after TDC	740 - 750	700 - 710	556 - 614
ID-6	.017	.019	10 before TDC	30 after BDC	43 before BDC	10 after TDC	740 - 750	700 - 710	556 - 614
UD-264	.017	.019	10 before TDC	30 after BDC	43 before BDC	10 after TDC	740 - 750	700 - 710	-
UD-9	.017	.019	10 before TDC	30 after BDC	43 before BDC	10 after TDC	740 - 750	700 - 710	446 - 494
UD-9A	.017	.019	10 before TDC	30 after BDC	43 before BDC	10 after TDC	740 - 750	700 - 710	503 - 557
TD-9	.017	.019	10 before TDC	30 after BDC	43 before BDC	10 after TDC	740 - 750	700 - 710	503 - 557
ID-9	.017	.019	10 before TDC	30 after BDC	43 before BDC	10 after TDC	740 - 750	700 - 710	503 - 557
UD-14	.018	.020	10 before TDC	25 after BDC	43 before BDC	10 after TDC	740 - 750	700 - 710	423 - 467
*UD-14	.018	.020	20 before TDC	40 after BDC	40 before BDC	10 after TDC	740 - 750	700 - 710	423 - 467
UD-14A	.018	.020	20 before TDC	40 after BDC	40 before BDC	10 after TDC	740 - 750	700 - 710	513 - 567
TD-14	.018	.020	20 before TDC	40 after BDC	40 before BDC	10 after TDC	740 - 750	700 - 710	423 - 467
TD-14A	.018	.020	20 before TDC	40 after BDC	40 before BDC	10 after TDC	740 - 750	700 - 710	513 - 567
UD-16	.017	.019	20 before TDC	40 after BDC	40 before BDC	10 after TDC	740 - 750	700 - 710	503 - 557
UD-18	.017	.019	10 before TDC	25 after BDC	43 before BDC	10 after TDC	740 - 750	700 - 710	423 - 467
*UD-18	.017	.019	20 before TDC	40 after BDC	40 before BDC	10 after TDC	740 - 750	700 - 710	423 - 467
UD-18A	.017	.019	20 before TDC	40 after BDC	40 before BDC	10 after TDC	740 - 750	700 - 710	513 - 567
TD-18	.018	.020	20 before TDC	40 after BDC	40 before BDC	10 after TDC	740 - 750	700 - 710	423 - 467
TD-18A	.018	.020	20 before TDC	40 after BDC	40 before BDC	10 after TDC	740 - 750	700 - 710	513 - 567
UD-24	.023	.025	20 before TDC	40 after BDC	40 before BDC	10 after TDC	740 - 750	700 - 710	484 - 536
TD-24	.023	.025	20 before TDC	40 after BDC	40 before BDC	10 after TDC	740 - 750	700 - 710	484 - 536

* 14 and 18 series engines with new camshafts and valve springs.

Injection Pump Settings

Note: *Field adjustment of IH single- and twin-plunger pumps for standard applications only. Refer to Charts I and II for adjustment measurement for Steps* 21, 22, 23, *and* 27. *Refer to Fig.* 14 *for Steps* 21 *to* 27.

Step 21 Torque lever stop screw—see note above.

Step 22 Torque spring shoe screw—see note above.

Step 23 Torque lever limiting screw (overload gap)—see note above.

Step 24 Shut off stop screw, 1/16- to 1/8-in clearance between pump housing and forward face of torque control assembly.

Step 25 Positive shut-off—Rack adjustment 1½ turns past shut off.

Step 26 High-speed idle—Check with tachometer. Adjust high idle stop screw.

Step 26A Bumper spring stop—Adjust eccentric to remove high idle surge.

Step 27 High idle gap—see note above.

Step 27A Field adjustment of governor and torque arm assembly.

Note: *Injection pumps are accurately set at the factory to give specified hp at rated and overload speeds. They are also set to govern satisfactorily between full load rated speed and no load speed.*

If the following procedure is observed carefully, a satisfactory field setting can be obtained whenever a pump has been rebuilt and requires resetting. This procedure is to be used only in an emergency when shop facilities and a test stand are not available.

1. Remove the pump housing oil filler neck and loosen the locknut on the rack. The pump housing side cover should be replaced by a cutaway side cover.

2. Adjust the torque lever stop screw until the face of the screw which contacts the torque lever stop pin is at the proper measurement (Step 21) from the finished surface of the torque lever, then tighten the locknut.

3. Adjust the torque spring shoe screw so that the lower face of the shoe is at the proper measurement (Step 22) from the finished surface beneath the locknut.

4. Adjust the torque lever pickup screw to the proper measurement (Step 23) between the torque lever stop screw and the torque lever stop pin.

5. With the control lever in the full shut-off position, loosen the locknut on the shut-off stop screw. Then adjust the position of the stop screw until there is 1/16- to ⅛-in clearance between the pump housing and the forward end of the torque control assembly.

6. With the engine stopped, disconnect one injection nozzle and connect the fuel pipe to a spare nozzle. Start the engine on gasoline. Adjust the rack adjusting rod nut. Adjust the rack until injection just starts with the throttle in the off position. Then adjust the rack by ¼ turns until the injection just stops. Following this, turn 1½ full turns in the same direction that stopped injection to insure positive shutoff.

Note: *Do not operate the engine too long on the gasoline cycle. Adjustments must be made within* 10 *min or less.*

7. Check the engine high idle speed with a tachometer. High idle speed can be corrected if necessary by adjusting the high idle stop screw.

8. High idle gap between torque arm stop screw and torque arm can be adjusted by turning the torque arm stop screw in or out to give the specified clearance. (Refer to "Fuel Delivery and Torque Arm Adjustment" charts I and II.)

9. Install the bumper spring and adjust the bumper spring stop to give a slight pressure on the bumper spring at high idle speed. If the engine surges, increase the pressure slightly. It may again be necessary to adjust the pickup limiting screw to the proper dimensions. Recheck the high idle speed and be sure the engine will shut off on the diesel cycle.

The engine is now ready to be checked in field operation. The following adjustments can be made if performance is not satisfactory.

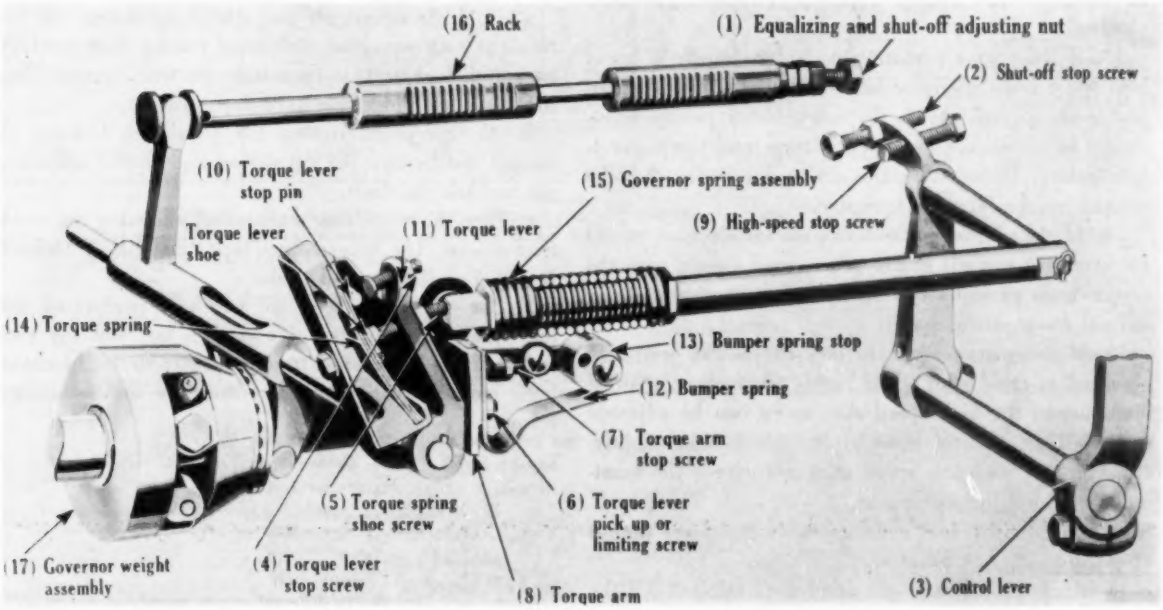

(16) Rack
(1) Equalizing and shut-off adjusting nut
(2) Shut-off stop screw
(10) Torque lever stop pin
Torque lever shoe
(11) Torque lever
(15) Governor spring assembly
(9) High-speed stop screw
(14) Torque spring
(13) Bumper spring stop
(12) Bumper spring
(7) Torque arm stop screw
(5) Torque spring shoe screw
(6) Torque lever pick up or limiting screw
(17) Governor weight assembly
(4) Torque lever stop screw
(8) Torque arm
(3) Control lever

Fig. 15 Skeleton view of twin-plunger pump governor.

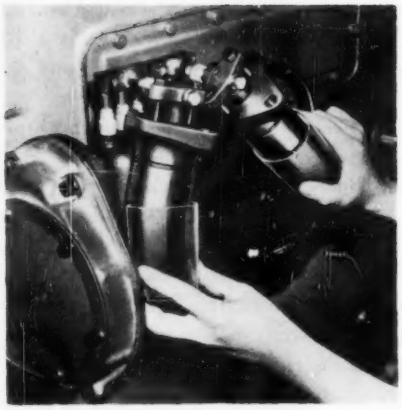


Fig. 16 Equalize fuel delivery on the twin-plunger pump.

10. If the engine surges at high idle speed, adjust the bumper spring stop to increase the pressure on the bumper spring.

11. If the engine seems to lack power at rated load speed and overload speeds, the gap between the torque arm and torque arm stop screw should be increased by turning the torque arm stop screw out ¼ turn. This adjustment can be repeated until the normal engine power has been obtained, but not to the point where the exhaust smoke becomes excessive at rated or overload speeds.

12. If the engine appears to have excessive power at rated and overload speeds, or if there is excessive exhaust smoke at rated and overload speeds, the gap between the torque arm and torque arm stop screw should be decreased by turning the stop screw in ¼ turn. Continue turning this screw in (at the same time checking the power) until correct engine performance has been obtained.

13. If the engine performance is satisfactory at rated load speed but the engine lacks power at overload speed and tends to stall easily, the torque lever pickup screw should be turned out ¼ turn at a time until the power is satisfactory. Do not turn this screw out so far that the exhaust smoke becomes excessive.

14. If the engine performance is satisfactory except for excessive exhaust smoke at overload speeds, turn the torque lever pickup screw in until the exhaust smoke is normal for overload speed.

15. If the engine seems to lack the power originally obtained at rated load speed but is satisfactory at overload speeds, the high speed stop screw can be adjusted to permit the control lever to be pulled back slightly. However, the high idle speed must not exceed the maximum specified for the engine.

Step 28 Equalize fuel delivery on twin-plunger pumps (6-cyl engines), as follows:

1. Attach the delivery test fixtures (1 0020 080 R91) to the discharge fittings as shown in Fig. 16.

2. Install two spare nozzles on the delivery test fixture. Be sure they are fastened securely. Operate the engine on the gasoline cycle. Open the diesel throttle all of the way and collect the fuel from the discharge lines as it leaves the nozzles connected to the fixtures. Collect the fuel in glass containers. Then pour the fuel into calibrated beakers. Collect fuel for ½ min. Close the diesel throttle and stop the engine. Then measure the fuel delivered by the front and rear plungers.

If the variation is more than 4 or 5 cc between front and rear plunger, adjust the turnbuckle to balance the delivery of discharge fittings 1, 2, and 3 with delivery from fittings 4, 5, and 6.

3. For pumps prior to "A" Series only: Adjust the rack by removing the pump from the engine and the cover plate from the inward side of the pump. By turning the turnbuckle clockwise as viewed from the drive end of the pump, fuel delivery of the front plunger will be increased. By turning the turnbuckle counterclockwise, front plunger delivery will be decreased (Fig. 17).

4. For "A" Series pumps: Install a line and nozzle on either the No. 1, 2, or 3 discharge fitting for the front plunger. Also install a line and nozzle on either No. 4, 5, or 6 discharge fitting for the rear plunger.

Adjustment will be made with the engine running on the gasoline cycle.

ADJUSTING THE FRONT PLUNGER:

a. Remove the injection pump oil filler. Through the opening in the pump housing, loosen the equalizing and shutoff locknuts.

b. Turn the equalizing and shutoff adjusting nut clockwise until fuel starts to eject from the front plunger; then turn this nut counterclockwise until fuel just stops, leaving both locknuts loose.

ADJUSTING THE REAR PLUNGER:

a. Hold the equalizing and shutoff adjusting nut and turn the rack equalizer (left hand thread) counterclockwise until fuel starts to eject from the rear plunger. Then turn this nut clockwise until fuel just stops.

b. At this point, tighten the equalizing locknut. Be careful not to turn the equalizing and shutoff adjusting nut or rack equalizer.

c. Turn the equalizing and shutoff adjusting nut counterclockwise 1½ turns; then lock the shutoff locknut. Install the oil filler and gasket.

If the preceding steps are carefully performed and the equalizing and shutoff adjusting nut and the rack equalizer are not moved from the exact shutoff position, both plungers will be well within the limits outlined below.

Engine Series	**CC Delivery per Test Fixture for 1 Minute*	*CC Variation Allowed Per Fixture*
16 18A 18A	200—300	5
24	301—400	7

**Delivery will vary due to different engine speeds on the gasoline cycle.*

Chart I

PRIOR TO "A" PUMPS - IH Single and Twin Plunger

FUEL DELIVERY AND TORQUE ARM ADJUSTMENT CHART - STANDARD APPLICATIONS

For Testing on IH Test Stand with IH Injection Nozzles Set at 700 P.S.I. Opening Pressure

The deliveries listed below were obtained by using nozzles 52 613 D, furnished with the test stand. It is essential that 52 613 D, DA, DB or DC shall be used with the test stand.

Fuel oil with a viscosity of 33 to 35 Saybolt Universal seconds at 100° F. was used for testing IH pumps when these figures were obtained. A fuel of higher viscosity will give more fuel delivery, and a fuel of lower viscosity will give less fuel delivery.

Model	Average Delivery in CC, at 550 r.p.m. for 550 revolutions	Maximum Permissible Variation of Any Nozzle from Average Deliv'y in CC	** Torque Control Adjustment				Torque Springs		
			Torque Lever Stop Screw	Torque Spring Shoe Screw	Over-load Gap	* High Idle Gap	No. Reqd.	Part No.	Thick-ness
TD-6, WD-6, MD, MDV	53	±3	3/8	5/8	1/16	.085	7	260 907 R2	.014
ID-6	53	±3	3/8	5/8	1/16	.085	7	260 907 R2	.014
IUD-6	53	±3	3/8	5/8	1/16	.085	7	260 907 R2	.014
UD-6	53	±3	3/8	5/8	1/16	.085	7	260 907 R2	.014
TD-9	63	±3	7/16	11/16	1/16	.090	7	260 907 R2	.014
WD-9, IUD-9	63	±3	7/16	11/16	1/16	.090	7	260 907 R2	.014
ID-9	63	±3	7/16	11/16	1/16	.090	7	260 907 R2	.014
UD-9	63	±3	7/16	11/16	1/16	.090	7	260 907 R2	.014
WDR-9	63	±3	7/16	11/16	1/16	.090	7	260 907 R2	.014
TD-14	80	±3	3/8	5/8	3/32	.090	10	259 736 R3	.010
UD-14	80	±3	3/8	5/8	3/32	.090	10	259 736 R3	.010
TD-14A	91	±3.5	3/8	5/8	1/16	.105	10	259 736 R3	.010
UD-14A	91	±3.5	3/8	5/8	1/16	.100	10	259 736 R3	.010
TD-14	90	±3.5	3/8	5/8	1/16	.105	10	259 736 R3	.010
UD-16	73	±3	3/8	11/16	1/8	.075	7	260 907 R2	.014
TD-18A	94	±4	7/16	5/8	1/16	.115	3	259 736 R3	.010
							2	259 737 R3	.020
UD-18A	94	±4	7/16	5/8	1/16	.115	3	259 736 R3	.010
							2	259 737 R3	.020
TD-18	92	±4	7/16	5/8	1/16	.115	3	259 736 R3	.010
							2	259 737 R3	.020
TD-24	116***	±5	3/8	5/8	1/16	.125	3	259 736 R3	.010
							2	259 737 R3	.020
TD-24, UD-24	116***	±5	3/8	5/8	1/16	.125	3	259 736 R3	.010
							2	259 737 R3	.020

*Indicates the gap between the torque arm and the torque arm stop screw at governed high idle speed. This measurement must be taken with the bumper spring removed unless the high idle gap tool 1 020 121 R91 is used.

**These dimensions should also be used when following the procedure for setting IH single plunger pumps on Bosch test stands.

***On some test benches already equipped with 100 CC beakers, it will be necessary to run the test bench at 550 r.p.m. for 1/2 minute, to obtain 1/2 the delivery listed above.

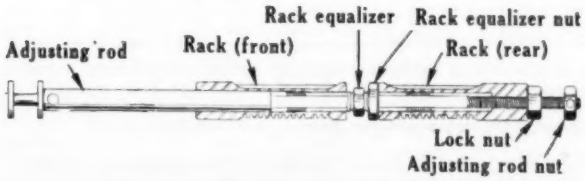


Fig. 17 Twin-plunger rack assembly adjustment points for pumps prior to "A" Series only.

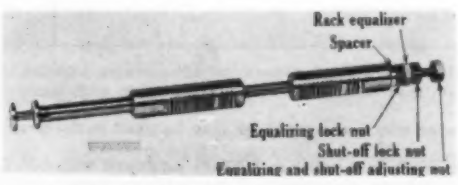


Fig. 18 For "A" Series pumps, adjust these points on the twin-plunger rack assembly.

Chart II

FOR "A" PUMPS - IH Single and Twin Plunger
FUEL DELIVERY AND TORQUE ARM ADJUSTMENT CHART - STANDARD APPLICATIONS

For Testing on IH Test Stand with IH Injection Nozzles Set at 700 P.S.I. Opening Pressure

The deliveries listed below were obtained by using nozzles 52 613 D, furnished with the test stand. It is essential that 52 613 D, DA, DB or DC shall be used with the test stand.

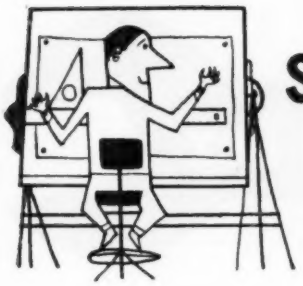
Fuel oil with a viscosity of 33 to 35 Saybolt Universal seconds at 100° F. was used for testing when these figures were obtained. A fuel of higher viscosity will give more fuel delivery, and a fuel of lower viscosity will give less fuel delivery.

Model	Average Delivery, in CC, at 550 rpm. for 550 revolutions	Maximum Permissible Variation of Any Nozzle from Average Delivery, in CC	* * Torque Control Adjustment				Torque Springs		
			Torque Lever Stop Screw	Torque Spring Shoe Screw	Overload Gap	* High Idle Gap	Number Reqd.	Part No.	Thickness
TD-6, WD-6, MD, MDV	53	±3	3/8	37/64 ± 1/32	.045 ± .030	.090 ± .005	7	260 907 R2	.014
TD-6, WD-6, IUD-6, MD, MDV (increased power).	68	±3	7/16	39/64 ± 1/32	.078 ± .030	.115 ± .005	8	260 907 R2	.014
ID-6. UD-6	53	±3	3/8	37/64 ± 1/32	.045 ± .030	.090 ± .005	7	260 907 R2	.014
ID-6 (incr. power) .	68	±3	7/16	39/64 ± 1/32	.078 ± .030	.115 ± .005	8	260 907 R2	.014
IUD-6	53	±3	3/8	37/64 ± 1/32	.045 ± .020	.090 ± .005	7	260 907 R2	.014
UD-6A	71	±3	7/16	41/64 ± 1/32	.055 ± .030	.110 ± .005	8	260 907 R2	.014
Super MD, Super MDV, Super WD-6,	69	±3	7/16	5/8 ± 1/32	.030 ± .020	.060 ± .005	8	260 907 R2	.014
UD-264	69	±3	7/16	5/8 ± 1/32	.060 ± .020	.120 ± .005	8	260 907 R2	.014
TD-9, WD-9, IUD-9,	63	±3	7/16	5/8 ± 1/32	.020 ± .015	.085 ± .005	7	260 907 R2	.014
TD-9 (incr. power).	65	±3	7/16	41/64 ± 1/32	.060 ± .020	.075 ± .005	7	260 907 R2	.014
WD-9 (incr. power).	65	±3	7/16	41/64 ± 1/32	.080 ± .020	.075 ± .005	7	260 907 R2	.014
ID-9, UD-9, WDR-9,	63	±3	7/16	5/8 ± 1/32	.020 ± .015	.085 ± .005	7	260 907 R2	.014
ID-9 (incr. power) .	65	±3	7/16	41/64 ± 1/32	.080 ± .020	.075 ± .005	7	260 907 R2	.014
UD -9A	70	±3	7/16	41/64 ± 1/32	.070 ± .020	.095 ± .005	7	260 907 R2	.014
WDR-9 (incr. power)	65	±3	7/16	41/64 ± 1/32	.080 ± .020	.075 ± .005	7	260 907 R2	.014
UD-350	--	--	7/16	41/64 ± 1/32	.030 ± .020	.100 ± .005	8	260 907 R2	.014
TD-14	80	±3	3/8	5/8	1/16	.095	10	259 736 R2	.010
TD-14A	91	±3	3/8	5/8 ± 1/64	.047 ± .030	.105 ± .005	10	259 736 R3	.010
UD-14A	91	±3	3/8	5/8 ± 1/64	.047 ± .030	.105 ± .005	10	259 736 R3	.010
TD-14	90	±3	3/8	5/8 ± 1/64	.055 ± .030	.095 ± .005	10	259 736 R3	.010
UD-14	80	±3	3/8	5/8	1/16	.095	10	259 736 R3	.010
UD-16	73	±3	3/8	19/32 ± 1/32	.060 ± .020	.070 ± .010	7	260 907 R2	.014
TD-18A	94	±4	7/16	39/64 ± 1/32	.075 ± .020	.105 ± .010	3 2	259 736 R3 259 737 R3	.010 .020
WD-18A	94	±4	7/16	39/64 ± 1/32	.060 ± .020	.105 ± .010	3 2	259 736 R3 259 737 R3	.010 .020
TD-18	92	±4	7/16	41/64 ± 1/32	.070 ± .020	.105 ± .010	3 2	259 736 R3 259 737 R3	.010 .020
TD-24	123***	±5	7/16	5/8 ± 1/32	.062 ± .015	.140 ± .010	3 2	259 736 R3 259 737 R3	.010 .020
TD-24 and UD-24 . .	122***	±5	7/16	5/8 ± 1/32	.075 ± .020	.140 ± .010	3 2	259 736 R3 259 737 R3	.010 .020

*Indicates the gap between the torque arm and the torque arm stop screw at governed high idle speed. On old type bumper springs, this measurement must be taken with bumper spring removed unless high idle gap tool 1 020 121 R91 is used.

**These dimensions should also be used in the procedure for setting IH single plunger pumps on Bosch test stands.

***On some test benches already equipped with 100 CC beakers, it will be necessary to run the test bench at 550 r. p. m. for 1/2 minute, to obtain 1/2 the delivery listed above.



service section

Recent engine and equipment modifications, procedures and recommendations straight from the different manufacturers to you

CUMMINS—Valve Service Specifications—All Engines . . .

Here is a handy guide to aid you in servicing valve mechanisms for Cummins engines. As you will note, the valve alone is not the only consideration.

Table 1 Valve Data

Part No. and Name		For Engines	New Stem Diameter	Worn Replacement Limit
70129	Exhaust Valve	A & JS	.402/.403	.401
68569	Intake Valve	A & JS	.402/.403	.401
9167-Y	Exhaust Valve	H-HR-HS	.496/.497	.495
69032	Intake Valve	HRS-HRSS	.496/.497	.495
70130	Exhaust Valve	NH-NHS	.402/.403	.401
68776	Intake Valve	NHRS-NHH NVH(S)-VT	.402/.403	.401
40751	Exhaust Valve	L & LR	.744/.745	.7435
43187	Intake Valve	L & LR	.744/.745	.7435
42184-1	Crosshead	NH(S)-NHR(S) NHH-NVH(S)-VT	.3708/.3713	.370
L-LR Valves — Edge of Head Thickness				1/8"
70129 Exhaust Valve — Edge of Head Thickness				3/32"
70130 Exhaust Valve (Chamfered)—Edge of Head Thickness				1/16"
All other valves listed — Edge of Head Thickness				1/16"

Table 2 Valve Guide Data

Part No. and Name		New Dimension	Worn Replacement Limit
9210-1	Valve Guide	.4995/.5005	.5015
66890	Valve Guide	.4045/.4053	.406
66889-1	Crosshead Guide	.3755/.376	.378
8073-1	Valve Guide	.7495/.7505	.752
68495	Valve Guide	.4045/.4053	.406
ST-284	Valve Guide Reamer		
	Pilot End Diameter	.497	
	Cutting Flutes Diameter	.5002/.5004	
ST-285	Valve Guide Reamer		
	Pilot End Diameter	.4023	
	Cutting Flutes Diameter	.4049/.4051	

Table 3 Valve Spring Data

Valve Spring Part No.	Free Length	Load Limits	Length
70033	2.944	81 to 91 lbs. @ 169 to 187 lbs @	2.406 in. 2.00 in.
9216-1	3 37/64	83 to 91 lbs. @ 129 to 143 lbs. @	2 11/16 in. 2 3/16 in.
66870	3 5/16	74 to 82 lbs. @ 104 to 114 lbs. @	2 1/4 in. 1 27/32 in.
8071-1	4 5/32	99 to 121 lbs. @ 226 to 250 lbs. @	3 9/16 in. 2 7/8 in.
68997	3.482	110 to 122 lbs. @ 179.5 to 198.5 lbs. @	2 11/16 in. 2 3/16 in.

Table 4 Valve Clearances

Set with water temperatures at 160° F., and with Injector Plungers Adjusted

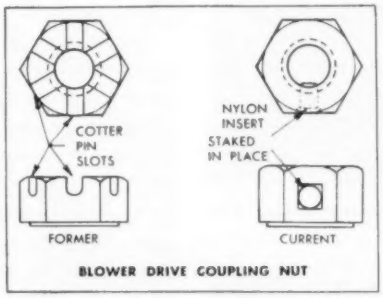
Engine	Intake Valves	Exhaust Valves
A and JS	.015	.025
NH, NHS, NHRS	.014	.027
H, HR	.014	.022
HS, HRS	.016	.028
L and LR (Diesel)	.014	.018
L and LR (Gas)	.014	.025
NVH, NVHS and VT	.014	.027

GM—Blower Drive Coupling Retaining Nuts—Series "110" Engines . . .

The blower drive coupling assembly, used in Series "110" engine centrifugal-type blower assemblies, is assembled with six special ¼-in pins. One end of each pin is threaded to accommodate the hexagon nuts used to hold the damper assembly to the drive gear, thus completing a blower drive coupling assembly.

To facilitate assembly and eliminate the use of cotter pins, the slotted hexagon nuts, Part No. 122698 (slotted to accommodate a cotter pin), used in the blower drive coupling assembly, were superseded by self-locking type hexagon nuts, Part No. 5188553 incorporating a small "plastic button" which is inserted (and staked) sufficiently into a drilled hole in the center of one of the hexagon sides so as to project slightly above the threads of the nut. The former and current nuts, which are completely interchangeable for servicing the coupling assembly, are shown.

During assembly of a blower drive coupling, start and turn the current six nuts onto the threads of the special pins by hand as far as possible. Install the coupling assembly onto a blower drive shaft, and in mesh with its drive gear, to ensure proper alignment of the components of the coupling assembly. Draw the nuts snug; then tighten to a torque of 10 to 12 ft lb, staggering the final tightening operation.



BLOWER DRIVE COUPLING NUT

The current nut may be *reused a maximum of two times,* after which the nut must be discarded since the plastic button will no longer safely maintain its retaining qualities.

Benefit derived from the use of the new nuts is that it is no longer necessary to line up the castellations of the former nuts with the cotter pin hole in the special pins, and eliminates the necessity for new cotter pins which must be replaced and spread each time servicing is required.

★ ★ ★ ★

WAUKESHA—Model 6WAKD Engines—Installing Full-Flow Lube Oil Filters . . .

Full-flow lube oil filters, engineered for these engines, are now being installed on most current production engines. For safe, effective filtering when converting to full flow in the field, Waukesha conversion kit No. 955-6 is available.

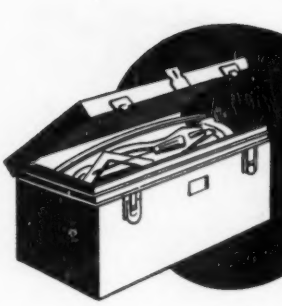
Several points concerning the relief valve body and method of connection are very important:

1. Full-flow pressure relief valve 041311-B differs internally from 041311-C assembly for bypass filter connections, even though outwardly identical, and must be used for full-flow filtering.

2. Filters are an integral part of the oil system, and it is not possible even in emergency to disconnect filters and plug line connections with intent to run engine without filtering oil. Examination of relief valve cross-section shows that this results in a dead-end passage for oil at relief valve and filter, with immediate engine failure caused by lack of oil.

3. To run engine temporarily

(*Continued on page 77*)



Straight from the Tool Box

This is YOUR Department. Pass along your ideas to the other fellow. Send items to the Editor, preferably with a picture or sketch. Contributors will receive $10.00 for each item upon publication.

Water Wash Helpful for Heavy Fuels

FREDERICK G. HEHR, SANTA MONICA, CALIF.—In the July, 1954, DIESEL POWER, there was an interesting article on exhaust valve difficulties when burning Bunker C oil. I thought that you might be interested in my experience.

In a marine installation, we were faced with the condition that exhaust valves lasted about three months on an average. When you are up against such a situation, you try everything to get relief and in the process you are sure to evolve some theories—particularly if they work. Here are my ideas.

Slag accumulations and the burning out (and off!) of exhaust valves occurs mainly when two conditions are present: (a) high exhaust temperature due to overload or late combustion, and (b) whenever there is salt, sodium chloride, calcium chloride, borax, etc., present in the oil. Note in item (b) that these materials are all in the flux category.

If loads are normal, the ash content of the oils, both fuel and lube, will not melt but will be carried out in fine dust form with the fine carbon particles that are present even in the cleanest exhaust. If the exhaust temperature (indicating high cylinder temperatures) goes up beyond certain limits, the ash will fuse in the presence of the flux materials. The fine droplets then will, again aided by the fluxing salts, adhere to the hot valve surface. This action helps erosion as well.

This was our thinking when we sought a remedy. First, a very rigid control of exhaust temperatures was a "must". Load distribution among cylinders was checked frequently via the exhaust pyrometer. Injection apparatus was kept in top condition and the injection timing set as early as possible for the load. This kept exhaust temperatures as low as possible too. We found that a fairly high combustion chamber wall temperature helped to get best performance with least wear and trouble.

The second step involved washing the oil with soft water. Most of the flux materials are soluble in water. Oil in the storage tank was heated to reduce its viscosity and warm soft water sprayed over it. In its passage through the oil, the water apparently contacted and dissolved a good deal of the troublesome materials. Most of the water along with the dissolved salts could be drawn off the tank bottoms without too much trouble. Centrifuging removed any remaining moisture.

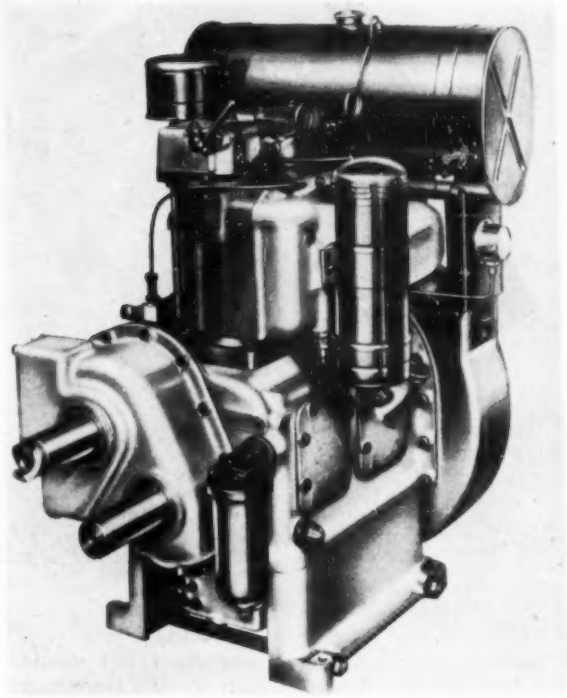
Washing could also be done in the centrifuge by adding water to the feed oil. One trouble with the heavier oils is that it is hard to break down some of the oil-water emulsions formed with so little difference in specific gravities. However, in the last analysis the whole subject is one of costs which are affected by the amount of equipment needed and the time involved.

Regarding washing fuel oils, a generous admixture of a suitable detergent might help a lot in the salt extraction. The dispersion would certainly result in more intimate contact. Again, costs are a factor. In cases where there are large storage tanks, a bottom layer of such water would extract quite a bit of the salts and alleviate the situation.

Anyhow, in this case I found that the water treatment was helpful. Valve life was stretched to from 10 to 12 months. Slag and erosion were greatly reduced.

This one really started us thinking—and checking. We contacted a good dozen technicians interested in the subject, but while no one could confirm or deny Mr. Hehr's theory, it aroused a lot of interest. Closest thing to a confirmation was found in the remarks of Mr. D. M. Landis, DeLaval Separator Co., at a General Technical Committee, OGP Div., ASME meeting on the subject of burning heavy fuels. Commenting on the use of a continuous-nozzle type centrifuge to purify a No. 6 oil for gas turbine use, he said that the use of magnesium sulphate or magnesium nitrate solutions (both with sp gr above 1.0) had reduced the sodium and calcium content of a fuel high in vanadium pentoxide. This resulted in a minimum of corrosion and deposits. So apparently chemical solutions help. There is no question but that a straight water wash worked for Mr. Hehr; the big question is whether this was an isolated phenomenon or whether it works across the fuel residual board. Anyone for testing?—Editor

news of our industry

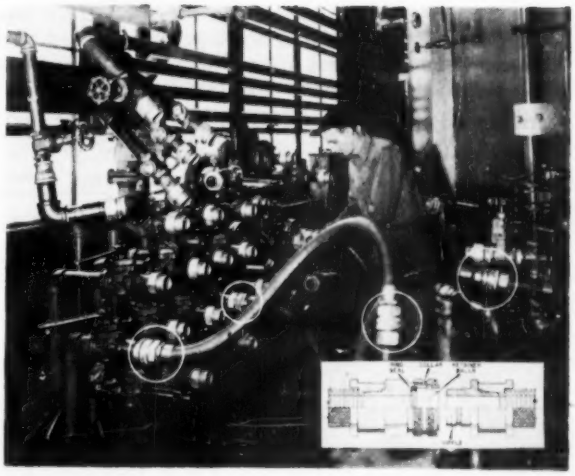


National Supply Gets Armstrong Siddeley Line

Engine Division of the National Supply Co. was recently appointed sole U. S. distributor for Armstrong Siddeley diesel engines. Manufactured in 1- and 2-cyl models by Armstrong Siddeley Motors, Ltd., of Coventry, England, they are of the 4-cycle, air cooled design.

The single-cylinder engine develops 6 to 11 hp at 1000 to 1800 rpm, and the twin-cylinder unit develops 14 to 22 hp with the same speed range. Bore and stroke is 4¼ in and the compression ratio, 15:1.

The engines are designed for general use such as in electrical generating sets, pumping sets, agricultural applications, or wherever else a reliable engine of this size and horsepower is required. According to the manufacturer, the engines operate reliably under tropical or arctic conditions. The unit shown is the 2-cyl model.



Quick-Change Hose Coupling Speeds Blending

The Gordon Lubricating Co. of McKees Rocks, Pa., blends automobile oils and greases to specifications and packages them for different concerns which market the packaged product under their own brand names. This entire operation is highly mechanized and largely automatic except for one operation which is done by hand.

But even this part of the production process has been sped up so that it causes practically no loss of time, thanks to a heavy-duty coupling of special characteristics, manufactured by Titeflex, Inc. of Springfield, Mass.

The Gordon Co.'s streamlined production setup makes use of several piping switchboards which permit the rapid switching of oils. The connecting and disconnecting of hoses to get the proper blend is a manual operation. Previously, all connections were made using hoses and threaded couplings. This wasted from five to ten minutes per connection. As shown in the illustration, connections are now made instantaneously by the use of quick-connect couplings (inset).

new products . . . . . Page 58

new literature . . . . . Page 62

organizational news . . . . . Page 64

Downtime?

What's the Price Tag on Yours?

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news of our industry

DEMA Holds Election

Thomas E. Hughes, general manager of the Cleveland Diesel Engine Div. of General Motors Corp., was elected president of the Diesel Engine Manufacturers Assn. for 1955 at its recent annual meeting. He succeeds A. W. McKinley, president of the National Supply Co., who has occupied the position for two years.

New DEMA President

Mr. Hughes became general manager of Cleveland Diesel at the beginning of 1953 upon the retirement of George A. Codrington. He has been with General Motors since 1933.

Returned to office for the new year are the two vice presidents: William E. Butts, president of Enterprise Engine & Machinery Co., and Walter A. Rentschler, vice president of Baldwin - Lima - Hamilton Corp.; treasurer: Robert H. Morse, Jr., president of Fairbanks, Morse & Co.; and secretary and executive director: Harvey T. Hill.

The following were chosen as directors for a 2-year period: William E. Butts; Guy J. Coffey, president, Chicago Pneumatic Tool Co.; Otto H. Fischer, president, The Union Diesel Engine Co.; Robert E. Friend, president, Nordberg Mfg. Co.; Gordon Lefebvre, president, The Cooper-Bessemer Corp.

Elected last year to serve for the same 2-year period are the following directors: C. Paul Clark, chairman of the board, Clark Bros. Co.; M. C. Davison, vice president, Ingersoll-Rand Co.; Thomas E. Hughes; A. W. McKinney; Robert H. Morse, Jr.; Walter A. Rentschler; E. J. Schwanhausser, executive vice president, Worthington Corp.

news of our industry

Truck Coordination Plan

A long-time goal of the trucking industry, standardized tractor-trailers, has reached its final acceptance stage. New coordinated equipment, it is said, will soon roll from tractor and trailer manufacturers. Eventually, nearly every tractor and trailer in the common carrier fleet will be readily interchangeable.

Adoption of a tractor-trailer coupling recommendation was announced at the annual membership meeting of the Regular Common Carrier Conference in New York City, which represents more than 2000 common carriers. A joint physical dimensions coordination subcommittee had been set up with the Automobile Manufacturers Assn. and the Truck-Trailer Manufacturers Assn. to work out engineering standards.

Their objective, to establish dimensions for tractors and semi-trailers so as to achieve interchangeability of equipment of maximum legal dimensions for a majority of states, and to permit increased loading space within these dimensions, has been set forth. The next step is full implementation.

Burgess-Manning Plans Merger

The board of directors of Penn Industrial Instrument Corp. announces that it has voted to accept a proposed plan for merging with Burgess-Manning Co. The proposal has been approved by the Burgess-Manning board and is now subject to approval of the share holders of both firms.

The merger proposal contemplates that Penn will be merged into Burgess-Manning which will continue as the surviving company. It was announced that if the plan is effected Penn would continue under its present management as a separate division. Penn manufactures electric and electronic flow meters, and temperature and pressure control instruments. Burgess-Manning is a manufacturer of pulsation snubbers, surge control and sound control devices, and sound absorbing equipment.

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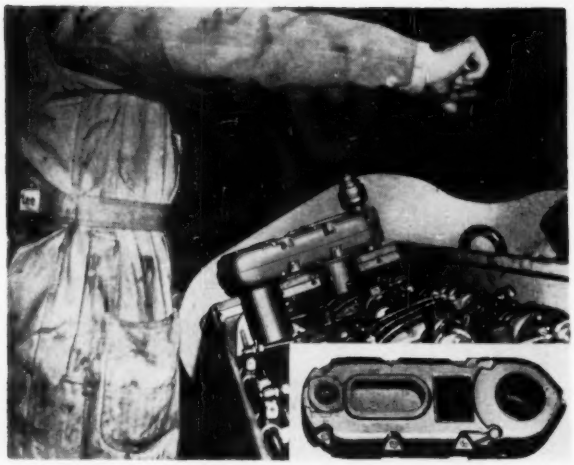


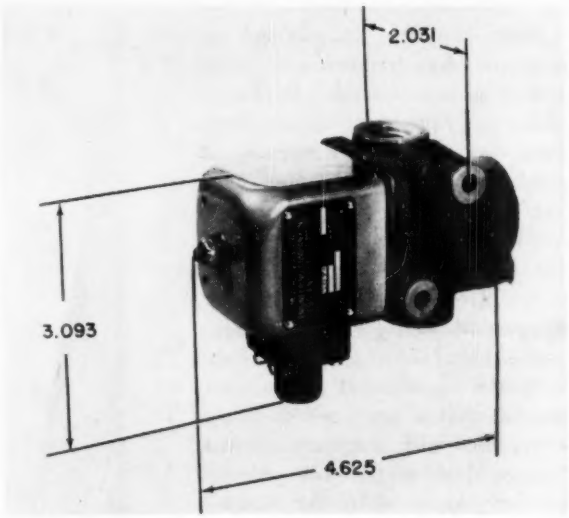
Torque Multiplier

Latest in the line of torque multipliers for high torque nut applications is the Model 104 "Powerench". Made by the B. K. Sweeney Mfg. Co., it is built on a pinion and ratcheting gear segment principle with a power ratio of 12:1. The tool is manually operated with a work handle or tension indicator. Because of its power advantage, only 150 ft lb need be applied at input to obtain 1800 ft lb at output, or 500 ft lb input for 6000 ft lb output, etc. The 29½-lb unit employs a ¾-in sq female input and a 1½-sq female output. Special anchoring devices necessary to position the tool and anchor the torque reaction are available from the manufacturer. Detailed information and prices are available from the company at 1601 23rd St., Denver, Colo.

Pneumatic Valve

Mar Vista Engineering Co. has announced its entry into the pneumatic valve field. A complete selection of solenoid-operated shutoff and selector valves for industrial, aircraft, and guided missile applications are now being offered by the company.

A few of the technical features of the pneumatic valve are pressure range from 0 to 3000 psi, temperature range —65°F to 265°F. Electrical current drawn for continuous duty is less than 1 amp at 24 v DC. Complete technical data sheets are available from the company at 5420 W. 104th St., Los Angeles, Cal.



Lubricator

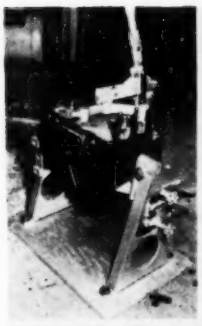
A fully automatic "system" lubricator is currently being produced by the Rail and Flange Lubricator Co. of 2784 N. W. Thurman St., Portland 10, Oregon. The unit, easily installed above the drive wheels of locomotives, is designed to apply an accurately controlled film of graphite-base lubricant to the throat of flanges.

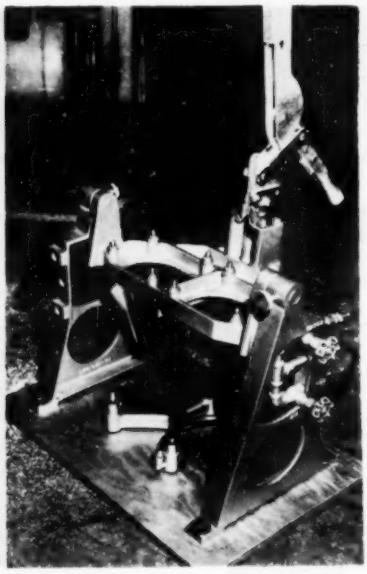
When utilized on a system-wide basis, sufficient lubricant is transferred to the pressure side of rails, frogs, and switch points to prolong the useful life of equipment and trackage, according to the manufacturer. The units are reportedly engineered to railroad requirements and designed to last for years under all operating conditions with a minimum of maintenance. Additional information and prices are available from the company.

Cylinder Head Tester

A new hydrostatic tester for use on the cylinder heads of Cummins "H" and "NH" series engines has been announced by the B. K. Sweeney Mfg. Co. Made of aluminum alloy, the new tester weighs less than 34 lb and is designed for either floor, bench, or wall mounting. The unit provides a fast, practical means of testing cylinder heads for leaks before the head is mounted on the engine.

Rubber grommets located on the revolving cradle of the tester support the cylinder head and seal off the water holes on the bottom of the head. Water or air, or a combination of water and air, is supplied to the head through an injector spider which mounts over the two water header holes on the top of the cylinder head. All points of contact are held in firm position by a 1-motion cam lock.





Water and air controls, including a pressure regulator, are conveniently located on the side of the tester for operation under pressure specified by the engine manufacturer. The cradle of the new tester is provided with large openings for unobstructed viewing of all portions of the cylinder head.

It can also be rotated and locked in any position for close inspections while the head is under pressure. It is designated Sweeney Model 641. A similar tester is being prepared for use on the cylinder heads of General Motors Series 71 diesels. A better idea of how the tester is constructed and how it works can be obtained from the accompanying illustrations. Detailed information and prices are available from the manufacturer at 1601 23rd St., Denver 17, Colo.

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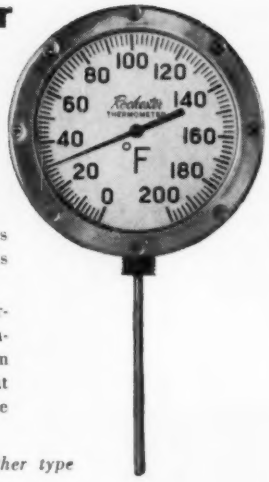

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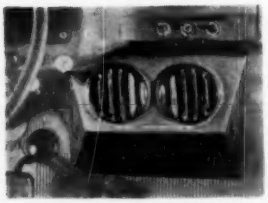


Automotive Air Conditioner

Claimed to be the first low-priced automotive air conditioner to be placed on the market is a unit selling for about $300 plus installation, which has been announced by Frigikar Corp., 1602 Cochran, Dallas, Texas. The adaptation for trucks is labeled Frigikab.

Under-the-dash housing of the unit contains the evaporator, blower-fan, thermostat, and air-direction louvers, which automatically hold in-cab temperatures in the 70-deg zone. Under the hood are the heavy-duty compressor, condenser, receiver, drier, and solenoid valve components said to be of the same type as those found in luxury-car air conditioning.

Up to 365 cu ft of refrigerated air per min are claimed delivered at high or low speeds in 100-deg or over weather, without detracting from engine efficiency or increasing battery strain. The units are also said to be easily installed and transferred from one truck to another with practically no upkeep.

Automatic Clutch Coupling

The Hilliard Corp., Elmira, N. Y., has a new addition to its line of industrial clutches, the Twiflex automatic clutch coupling, manufactured under license from Compression Ignition Ltd. of England. The coupling features ability to handle all types of misalignment.

It is said to improve starting conditions and provide smooth acceleration on drives for high inertia equipment, prevent excessive torque transmission during starting, prevent torsional resonance on engine drives, provide automatic coupling on emergency and dual drive systems, and provide overload protection. For more details and specifications, Bulletin CE-3 is offered.

new products

Portable Vibration Meter

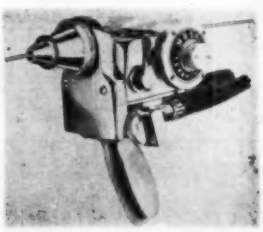
A direct-reading and portable vibration meter capable of measuring both displacement and acceleration has been announced by General Electric Co.'s Meter and Instrument Dept., Schenectady 5, N. Y. It consists principally of a barium titanate accelerometer, which feeds through an electronic amplifier and a copper-oxide rectifier to an indicating microammeter.

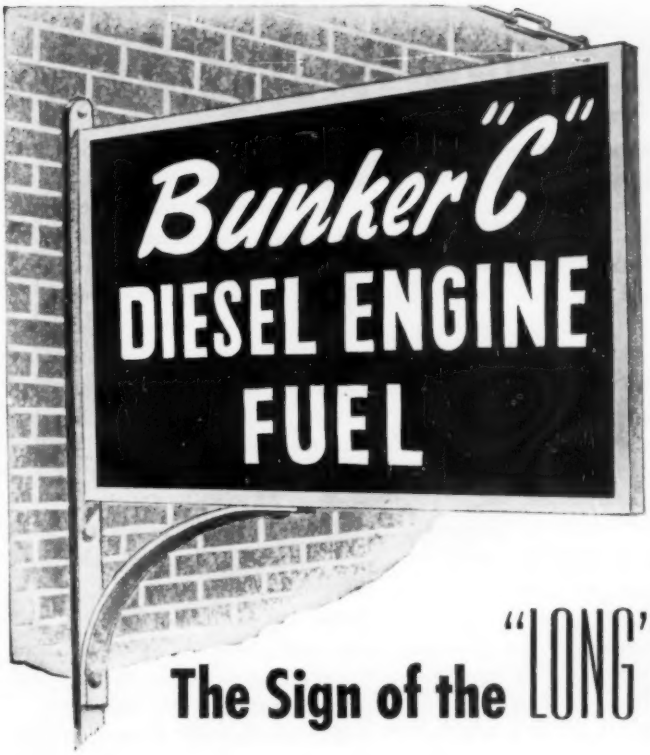
Operation of the instrument is said to be unaffected by magnetic fields. It works on hearing aid batteries, and battery voltage and calibration is said to be easily checked by adjustment of selector switches on top of the instrument. It weighs about 5 lb, has overall dimensions of 4 by 8 by 13¾ in, and is equipped with a pistol grip and trigger-type switch.

Flexible Metalizing Gun

Metallizing Co. of America, 3520 W. Carroll Ave., Chicago 24, Ill., has placed in production a new metalizing gun, tradenamed Turbo-Jet, which is claimed flexible enough to take care of all spraying operations. The gun may be used in a tool post or hand-operated. It weighs 5½ lb.

The instrument has been designed to spray an extremely fine dense coating, using wire from 20-gauge to 3/16-in diam, from the highest melting point molybdenum to the lowest melting point wires. A general purpose tool, it is used to spray both hard and soft metals. Dual feed rolls, individually driven, are said to eliminate possibility of wire slippage. It operates on acetylene, propane, or natural gas, 15 psi, and has a wire speed range from 2½ in per min up to 20 fpm.





The Sign of the "LONG" Dollar

Residual oils make low cost diesel engine fuel when the unburnables are removed by the Sharples continuous oil purifier.

Over 20 years ago the first Sharples went into service on an oil company tanker; they are still burning Bunker "C" in their diesels.

Today, the economies are many times greater, as proved in the numerous installations where Sharples is actually up-grading this low cost "residue" oil to an economical, efficient fuel.

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new literature

Selective Telemetering

For effective remote operation of substations, generating plants, pipeline pumping stations, etc., information about power flow, generation, oil pressure and flow, bus voltage, and many other values is required. Yet most central control stations give the operator much less data than he would have if he were manning the remote station, for it is not economically feasible to continuously telemeter all such information.

Motorola, Inc., 4501 W. Augusta Blvd., Chicago 51, Ill., has issued a technical bulletin said to provide an answer to this cost problem. Based on a talk, "Selective Telemetering Applications", presented at the National Telemetering Conference by a power utility engineer and a systems engineer, it reveals how a compromise can often be worked out to provide some information continuously and other data selectively. Shared use of telemeter communication channels with supervisory control systems that permit actual remote control of valves, etc., is claimed not only to reduce original cost of transmitting equipment, but also to cut space requirements and permit shared use of telemetering instrumentation and sensing devices.

Product Christmas Card

To symbolize the advantages of its product, solid film dry lubricants, Electrofilm, Inc., P. O. Box 106, N. Hollywood, Cal., is mailing a Christmas card consisting of a Styrofoam block with two die-cut channels (aluminum backing) for chimneys.

With a slight tilt of the card, Dr. E, the company's symbol, slides down the longest chimney while Santa Claus slides down the other chimney at a much slower pace. Dr. E slides easier because his chimney has been "Electro-filmed" with solid dry film lubrication. Santa Claus slides down a chimney of bare metal.

2-Cycle Diesel Engines

Publication of a 12-page bulletin describing its 29-in bore stationary and marine diesel engines ranging in size from 4500 to 10,800 hp, is announced by Nordberg Mfg. Co., Milwaukee 1, Wis. The bulletin shows the engines installed in municipal central power stations, public utilities, industrial plants, and in tanker and cargo vessels.

Savings that may accrue from use of straight run or cracked residual fuels are pointed up. The Type TS-29 engine described operates as a dual-fuel unit for economies where gas is abundant. Photographs and cross-sectional drawings show construction features of the units and their components.

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new literature

Replacement Mufflers

An 8-page illustrated catalog recently released by Alexander-Tagg Industries, Inc., Hatboro, Pa., describes the company's new line of heavy-duty truck and bus mufflers, stacks, and exhaust systems. Included are alphabetical listings of recommended mufflers for most trucks and buses in use today. Mufflers and exhaust system parts are illustrated together with a chart showing maximum cu in engine displacement for each muffler and proper inlet and outlet sizes.

Blast Cleaning Process

Up-to-date facts on blast cleaning are covered in a new manual recently approved by the technical board of Soc. of Automotive Engineers, Inc., 29 W. 39 St., New York 18, N. Y. It has been issued as a companion to the society's manual on shot peening, published several years ago.

The manual includes data on blasting machines, blasting abrasives, recommended cleaning practices, production procedures, inspection, and shot and grit specifications. It contains 36 illustrations and 3 tables and sells for $2 to members, $4 to non-members.

Diesel Fuels Symposium

At a meeting of the American Soc. for Testing Materials' Committee D-2 on petroleum products and lubricants, held last February in Philadelphia, nine papers were presented designed to cover all phases of the diesel fuel picture. A publication, "Symposium on Diesel Fuels", 56 pages, $1.50, has now been made available by the society, 1916 Race St., Philadelphia 3, Pa.

Tentative classifications of diesel fuel oils (D 975—53 T) are included in the book. It begins with an introduction by W. King Simpson, General Motors Corp., and is followed by the papers:

"The Availability and Demand Outlook, Distribution and Principal Properties of Domestic Diesel Fuels" by C. M. Larson, Sinclair Refining Co.; "The Increasing Use of Furnace Oils for Diesel Fuel" by Harold V. Messick, Ashland Oil and Refining Co.; "Distribution and Storage Problems with Diesel Fuels" by C. C. Moore and W. P. Lakin, Union Oil Co. of California; "Survey of Diesel Fuel Oils Available at Roadside Filling Stations" by W. A. Howe, Gulf Oil Corp.; "Technical Problems Associated with Diesel Fuels in Interstate Coach Operation" by W. A. Duvall, The Greyhound Corp.; "Technical Problems Associated with Diesel Fuels in Contractors' Equipment" by J. W. Vollentine, Caterpillar Tractor Co.; "Technical Problems Associated with Diesel Fuels in Railroad Operations" by R. W. Seniff, The Baltimore & Ohio Railroad Co.; "Diesel Fuels in Marine Operation" by C. E. Haberman, Socony-Vacuum Oil Co.; and, "Diesel Fuel Specifications Requirements" by C. C. Ward, U. S. Bureau of Mines, Department of the Interior.

organizational news

Brown Boveri Adds Engineer

Brown Boveri Corp.'s New York office has announced the appointment of Dr. Ledo R. Carletti to its engineering staff. He will be in charge of all consultation on supercharging of diesel and gas engines.

Dr. Carletti first worked as a research engineer on diesel pumps at the Scintilla Works in Switzerland. He later joined the parent organization of Brown Boveri in its Baden, Switzerland plant as a member of the turbocharging department where he was concerned with development of large 2-cycle marine diesels. He came to the United States at the end of 1953 to join Worthington Corp. as a consulting engineer on supercharging of gas engines.

Dr. L. R. Carletti

Wilkening Appointment

John O. Lutz has been named the new assistant chief engineer of Wilkening Mfg. Co., maker of Pedrick piston rings. He has had experience in production, design, and development of internal combustion engines with such concerns as Baldwin-Lima-Hamilton Corp. and North Carolina Shipbuilding Co.

Roger Birdsell

Yates-American Director

Yates-American Machine Co. announces the election of Roger Birdsell, vice president, to the board of directors of the company. Mr. Birdsell has been with the organization for more than 20 years. He began as manager of the Radiator Div., now the Heat Transfer Products Div., when it was formed.

At the same time, the company announced that J. J. Gallagher has been elected president to succeed E. J. Dalton. Mr. Gallagher was formerly vice president. Mr. Dalton who held the positions of president and chairman of the board will continue in the latter capacity.

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organizational news

H&B American Buys Brockway

H&B American Machine Co., Inc. announces that it has entered an agreement for the purchase of substantially all of the assets of Brockway Motor Co., Inc., including the Brockway name. This incorporates a 5-year lease of Brockway's Cortland, N.Y. plant with option to purchase. The acquisition is said to fit into the pattern of industrial ownership of the Pawtucket, R.I. firm.

No change in operation is contemplated for the 78-year-old Brockway organization, a major truck manufacturer. Jacob Saliba, present executive vice president, will become president and general manager and other executives will continue in their present capacities.

Enterprise Names Two Managers

The Enterprise Engine and Machinery Div. of General Metals Corp. has announced the appointments of Arthur W. Ostrander as general sales manager and John H. Sheusner as manager of operations.

Mr. Ostrander's appointment is part of the company's expansion program which includes introduction of new engine models in excess of 5000-hp capacities. He was formerly executive vice president of American Farm Machinery Co. and before that was vice president of sales for the Farmhand Div. of Superior Separator Co.

Mr. Sheusner has been associated with Enterprise since February of 1945. In his new post he will have complete charge of all engine research, development, and engineering activities, together with manufacturing in all of its phases.

J. H. Sheusner

A. W. Ostrander

W. J. Brinkworth

J. G. Samuell

Link-Belt Managers

Link-Belt Co. has made known the advancement of William J. Brinkworth to manager of oil field sales, a newly created post. His headquarters will be at the company's Ewart, Ind. plant. James G. Samuell has been appointed to succeed him in Houston as district manager of oil field distributor sales.

Mr. Brinkworth started with the company in 1929 and worked in the production, pricing, and estimating departments, plus eight years in sales. He was transferred to Houston in 1946. Mr. Samuell will be in charge of distributor sales in the central states. He joined the company in 1945 as a sales engineer.

Robertshaw-Fulton Elections

The board of directors of Robertshaw-Fulton Controls (Canada) Ltd., recently formed subsidiary of Robertshaw-Fulton Controls Co., has elected John A. Robertshaw, president; George A. Elliott, vice president and general manager; Walter H. Steffler, secretary and treasurer; B. D. Taylor, comptroller; and H. William Biggar, assistant secretary and assistant treasurer. Messrs. Robertshaw, Steffler, and Taylor hold the same positions with the parent firm.

Mr. Elliott comes to the company from Canadian Westinghouse Supply Co. where he was national manager of apparatus and supply. Earlier in his career he was general manager of Kearney Corp. and served with Canadian Line Materials. As general manager of the new company he directs an operation that will produce a variety of instruments and control devices for Canadian industry.

Mr. Biggar was formerly with a manufacturer of truck-trailers. He was with Canada Life Assurance Co. before that for a 10-year period.

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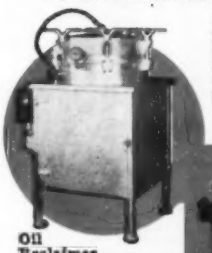

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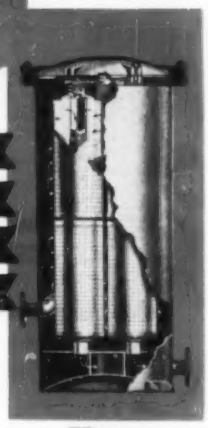

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organizational news

Flexonics Appoints Two

E. L. Hiter has been appointed sales manager of the Expansion Joint Div. of Flexonics Corp. and Frank C. Hesterman has become technical staff assistant in the production department, according to recent announcements of the company.

Mr. Hiter has 14 years of company experience in metal hose and bellows-type expansion joints. He has been serving as western manager since 1952. Prior to that he held sales administrative positions.

Mr. Hesterman holds 19 years of company service. He has previously been factory manager of the Savanna, Ill. division in charge of pipeline expansion joint manufacture. Before that he was chief engineer in charge of expansion joints in the research and development division at Elgin, Ill.

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FOR HEATING, REFRIGERATION, AIR CONDITIONING, GAS APPLIANCES, PUMPS, AIR COMPRESSORS, ENGINES

Nickel Cadmium Vice President

Grenville B. Ellis has been appointed executive vice president of the Nickel Cadmium Battery Corp., effective January 1, 1955.

Early in his career, Mr. Ellis served with Westinghouse Co. as an electronics engineer and from 1935 to 1940 he was chief engineer of Control Instrument Co. Since 1940, he has held the position of chief of the Power Sources Branch, U. S. Signal Corps, in charge of all research and development in that field. Under his direction, the organization made developments and improvements in batteries that have been widely accepted in military and commercial fields. He holds patents on storage and primary batteries and is said to have been directly responsible for introduction of many new types of batteries in this country.

G. B. Ellis

R. L. Stephenson

U.S. Hoffman Vice President

The combining of its air appliance and industrial filtration divisions into the industrial equipment division has been announced by U.S. Hoffman Machinery Corp. Revis L. Stephenson, general manager of the air appliance division, has been elevated to the position of vice president in charge of the new division.

Mr. Stephenson joined the organization in 1936 as a mechanical engineer. He advanced to field engineer in 1941 and became assistant manager of the air appliance division in 1946. In 1952 he was given the post of general manager. The new organization takes effect December 22. It was announced as a move aimed at expanding sales of industrial products in line with recent general expansion plans within the corporation.

organizational news

Daros Piston Ring Distributor

D. D. Cook, formerly president of Cooktite Ring Sales Co., announces that he has established a new organization, Daros American Corp. The reorganization is the result of the firm's appointment as exclusive wholesale distributors in the Americas of Daros piston rings, trade-named product of Ab. Davy Robertsons Maskinfabrik, Swedish manufacturers.

The rings, made of "anti-corrosive Swedish iron", are used in original factory assembly in Europe. The new distributor promises immediate delivery from Chicago for all popular sizes and types used on large bore diesel and gas engines. Delivery time on other sizes will take four to six weeks.

CPR Diesel Appointments

Emphasizing the increase in diesel operations by the Canadian Pacific Railway is the announcement of four new appointments in the mechanical department of the railroad.

T. G. Dingwall has been promoted to district diesel inspector at Winnipeg after three years as assistant district diesel inspector at Calgary. He started with the company as an apprentice electrician in 1934.

J. A. Fowle will replace Mr. Dingwall as assistant district diesel inspector after seven years as diesel maintainer in Winnipeg. He began his apprenticeship as an electrician at Winnipeg in 1924.

R. Bryant has been moved up to assistant district diesel inspector at Moose Jaw after three years as a diesel maintainer at Revelstoke and Nelson. His service goes back to 1944 as an electrician apprentice at Moose Jaw.

C. B. Hawkins has become assistant district diesel inspector at Winnipeg after 10 years as diesel maintainer. He began as a machinist in 1942.

Detroit Diesel Distributors

Three new distributors have been named by Detroit Diesel Engine Div., General Motors Corp. All three have established complete factory-approved sales and service facilities.

In upper Michigan, Lake Shore Engineering Co. of Iron Mt. will serve the mining, logging, and construction industries. Reid-Holcomb, Indianapolis, Ind., has located sales engineers in principal Indiana cities to service the state. Throughout the Columbus, Ohio area, Columbus Equipment Co. has service cars and mechanics available for on-the-job engine servicing.

Worthington Advances Engineer

Joseph B. Inferrera has been promoted to the post of executive engineer with headquarters at Worthington Corp.'s Wellsville, N.Y. plant.

Mr. Inferrera joined Worthington in 1937 as a turbine design engineer and served as chief draftsman and mechanical design engineer prior to being named chief mechanical design engineer in 1947. Before entering Worthington, he had been associated with Crittenden Mfg. Co., General Electric Co., and B. F. Sturtevant Co.

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no other chemical completely nullifies the corrosive effect of aeration.

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Typical uses for Mutual Chromate corrosion inhibitors are in cooling towers, heat exchangers, condensers, engine and compressor jackets, boilers and idle equipment, hydraulic systems and refrigerating brines. Write to our Research and Development Division for recommendations for using Chromates in your equipment or process.

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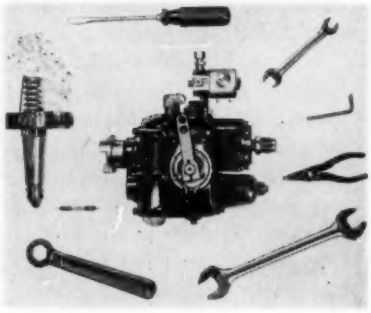
news of our industry



PT Fuel System Maintenance

Cummins Engine Co., Inc., announces the elimination of expensive tooling for its fuel injection system. All that is needed for normal maintenance of the PT system are two end wrenches, one allen wrench, a pair of snap-ring pliers, a screw driver, an injector cup wrench, and an injector plug gauge. The tools are pictured around the fuel pump and injector.

Field reports, according to the company, show that the fuel pumps have operated over 250,000 mi without adjustment. Cummins believes that its pump is the only diesel fuel pump in commercial use that does not have to be timed to the engine. The system is now standard on all Cummins diesel models and may also be adapted to those built since 1932.

Packaged Drilling Rig

At the recent American Petroleum Institute's annual convention the oil industry's "first standard package electric-power drilling rig" was announced. It was introduced by American Locomotive Co. and is designed as an integral package to furnish all power requirements for offshore or land drilling.

The new power plant is priced to sell at about the cost of a conventional power rig. According to John Thomas, marketing manager for Alco's stationary diesel engine applications, major oil and drilling companies have expressed interest and are particularly attracted by the fact that the package can easily replace a steam rig at competitive cost.

The plant consists of eight skid-mounted components with the power generated by two diesel generator sets. Each set contains a diesel engine, two main generators, and an auxiliary generator for extra power needs. Two motors, mounted on one skid, drive the draw works which raises and lowers the drilling bit and drill pipe.

Two pump motors circulate drilling mud. A main control cabinet, mounted in front of the two diesel generator sets, distributes the power as required. A driller's control cabinet and control stand complete the package.

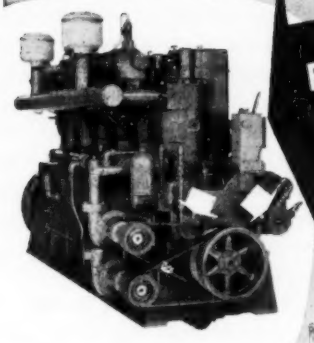
Flexibility of the package is said to permit the driller to run the draw works, pumps, rotary table, or other drilling apparatus, singly or in combination. It is so designed that a third diesel generator set for extra power or other modifications can be made by simple additions to the control panel. No matter what modifications are made, it is claimed, the control system is so simple that a driller can operate the rig with push-button ease.

Alco, with six plants in this country, is a major producer of pipeline engines and heat transfer equipment for the petroleum refining industry. The new package power plant will enable it, it was announced, to strengthen its coverage of the oil drilling industry for which it now produces valves, blocks, and wellhead equipment.

Van der Horst Expands in Texas

A $400,000 expansion program has been announced for the Terrell, Texas plant of the Van der Horst Corp. An increased demand in the South and Southwest for its patented iron and chromium plating processes, Vanderloy and Porus - Krome, is credited by the company for the expansion. The two processes are used for reclamation of worn cylinders.

The Terrell plant, established in 1952, has been limited in production by an existing 18,500-amp plating capacity. An increase to 40,000 amp is one of the major factors in the expansion program. Facilities for iron plating are also being added. It is expected that potential productive capacity would be tripled.



For POSITIVE LUBRICATION

It Pays to Specify

TUTHILL PUMPS

For dependable lubrication of diesel engines and power units, Tuthill offers a complete line of positive displacement pumps, designed for lubricating and scavenging. Included are automatic reversing pumps and stripped models for built-in applications.

Write for the Tuthill Pump Guide listing all Tuthill Pumps for lubricating requirements. Send specifications for quotation.

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DETROIT

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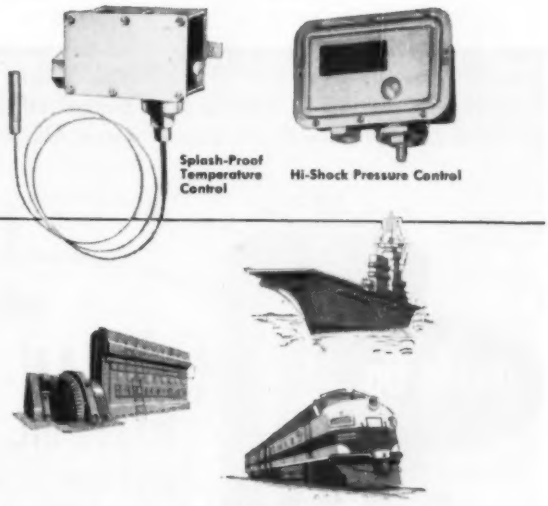

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Typical Pressure and Temperature Switch Applications are for pumps, refrigeration, air conditioning, heating, diesel engine alarms, lube oil pressure and temperature alarms, desuperheater alarm, pneumatic and hydraulic clutches, air compressors, high and low level alarms, and many other temperature and pressure applications.

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Designed to Meet Navy Class A Hi-Shock Specifications for drip-proof, splash-proof, spray-tight, watertight and submergence enclosures. Explosion-proof enclosures available for certain models.

Ranges: Temperature types—minus 100°F. to plus 600°F.; Pressure types—30" of vacuum to 5000 lbs. pressure.

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news of our industry

English Fear Diesel Tax

A major topic of concern in British automotive circles is an anticipated increase in derivative fuel taxation. The fear of a tax increase underscores the special interest the country has focused on diesel engines for light vehicles of the 1- to 2-ton class, such as taxicabs, which run up a lot of mileage.

At present, the rate of taxation is the same for derivative as for gasoline. Because the improved specific fuel consumption of diesel power units will show a decrease in revenue for the government, it is considering hiking taxation on the derivative.

Various organizations in the country, connected with development of automotive diesels, are thinking of joining forces to see that the government doesn't load the dice against the fuel just because the engine which uses it has a higher thermal efficiency. Further developments will be reported.

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TYPE "MC"—Cotton bag packed with Cranite (fuller's earth). Removes products of oxidation... acids, gums, etc. Provides refinery-type purification.
TYPE "MF"—Perforated metal basket packed with Palconia (cellulose fiber). Recommended for additive oils for complete removal of dirt, scale and other solids.
TYPE "S"—Contains Palconia (cellulose fiber). Performs same as Type "MF." Fiber center-tube simplifies disposal of spent cartridge by burning.
TYPE "E"—Similar to Type "S" except that filtering material is cotton waste and excelsior. Type "E" is recommended when water is encountered in the oil.
The Honan-Crane "Multi-Cartridge" Purifier is engineered, inside and out, to provide the high-flow, thorough oil purification essential for diesels. Removes all types of harmful contamination . . . substantially reduces engine wear and maintenance costs . . . quickly pays for itself in oil savings alone!
Here are a few time-tested Honan-Crane features:
1 Four types of interchangeable cartridges.
2 Clean oil is drawn from top of purifier for maximum cartridge efficiency.
3 Cartridge construction prevents channeling.
4 Electric heater bands maintain correct oil temperature for purification.
5 Oil-and-gas-tight seals and gaskets prevent contamination of clean oil passages.
6 Double-decked cartridges save floor space, permit greater operating efficiency.
7 Positive locks and pressure springs keep cartridges securely in place, prevent by-passing.
8 Purifier is fully equipped with automatic controls and safety features.
Honan-Crane Fuel and Lube Oil Purifiers are available for any size or make of Diesel Engine. For detailed information, write Honan-Crane giving make, model and H.P. of your diesel. Describe any unusual aspects of your particular oil purification problem.
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Ski Enthusiasts Dieselized

In the Mt. Mansfield ski area near the village of Stowe, Vt., the ski center of the East, a new chair lift and ski slope is nearing completion, and Spruce Peak Mt. has a great scar down its side. More than one million yards of granite rock have been pushed aside to give added enjoyment to the thousands of enthusiasts who journey to the area from December to May.

The new chair lift will be able to handle twice the number of the only other lift in the area. Clearing started late in 1953. Spring blasting leveled ledges in tough glacial rock on the side of the mountain and Cat crawler tractors then moved in to clean up the rock and smooth the slope.

Two 270-hp Caterpillar diesels, working alternately, will provide power for the lift which has a capacity of 800 skiers per hour. The engines will be direct-connected to a reduction gearbox that will drive a 12-ft bull wheel. Work on the entire job was accomplished by Mt. Mansfield Co. employing a No. 6 shovel, D6 and D4 crawler tractors with dozers, and HT4, D6, D7, and No. 212 motor graders.

Worthington Plant in Spain

A new plant was recently opened in Madrid by Worthington Corp.'s associated company, Bombas y Construcciones Mecanicas Worthington, S.A. The plant will produce pumps ranging from feed pumps for locomotives to deep well and vacuum pumps, as well as diesel engines and steam turbines. Worthington, which has 15 plants in the U.S. and 12 in foreign countries, opened its first office in Spain in 1915.

LMOA to Hold Chicago Exhibit

The Locomotive Maintenance Officers' Assn. announces that the Assn. of American Railroads has approved its annual meeting and mechanical exhibit to be held in Chicago on Sept. 12-14, 1955. A program has been set up to develop the latest and best ideas on diesel locomotive maintenance for the annual meeting.

news of our industry

Diesel Locomotives to Yukon

This winter, two diesel-electric locomotives will operate between Skagway, Alaska and Whitehorse, Canada. They will be the first to be used in the Yukon. In just 20 mi, the locomotives must pull their loads from sea level to a 2885-ft elevation.

Built by General Electric Co., the 86 tonners are expected to pull 260 tons as compared with the 160 tons of the steam engines now in service. Each locomotive has a box-type cab for heating purposes. Heating is by radiation from engine and accessories. The box cab also enables the fireman to reach all power plant and control apparatus without encountering outside elements.

Winterization includes outside piping insulation, additional operating cab insulation, pre-heating of fuel, engine radiator air recirculation, additional heating of engine cooling water during periods of engine idling, and extra protection of storage batteries by heating battery box air.

A rotary snow plow must precede the train although the locomotives have double-thick plows. The rotary must run close enough to be visible or the track is apt to be reburied. Snow depth on top of the mountains measures 40 ft and the 2-story White Pass Summit station has been known to literally become part of a snow drift.

India to Develop Oil from Coal

The Indian government recently announced it is considering the establishment of a plant for the manufacture of synthetic oil from coal. The scheme envisages development of coal resources of the country and production of gasoline, diesel oil, and gas.

It is estimated that between five and eight tons of coal are required for the extraction of oil. The government has deputed a geology expert to test coal samples and examine the supply positions of various states.

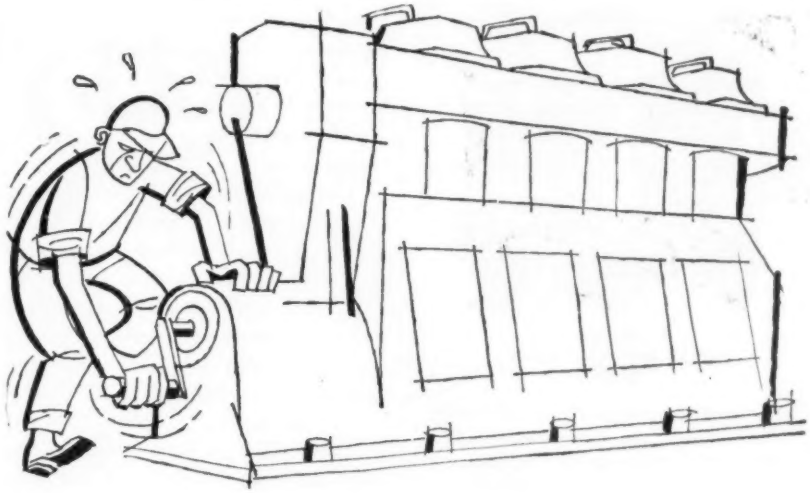
The announcement did not reveal what production method will be utilized. Currently, South Africa is making use of a combination of two processes, one for the liquefaction of high-grade coals by hydrogenation, the other processes low-grades by the Fischer-Thorpe method.

The plant in India will have capacity for the manufacture of 106,000 tons of aviation fuel, 112,000 tons of gasoline, 17,000 tons of diesel oil, 14,000 tons of fuel oil, and 400,000 tons of charcoal. It is estimated that a plant of this size will require 2 million tons of coal annually.

Pipeline to Transport LPG

Winnipeg Central Gas Co. announces it is planning a $20 million pipeline system to transport liquid propane from oil fields and refineries. Construction is expected to start next spring.

The liquid will be converted to propane air gas before being piped to Winnipeg. It was not determined how far the system might extend. At present, collection and distribution of the company's propane gas is being made principally by tank car and truck.



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Quincy Compressors are designed and built for *dependable operation.* When you select Quincy, you can be sure of compressed air when you need it.

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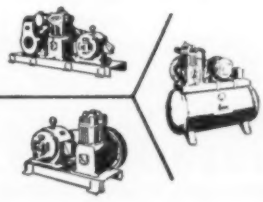

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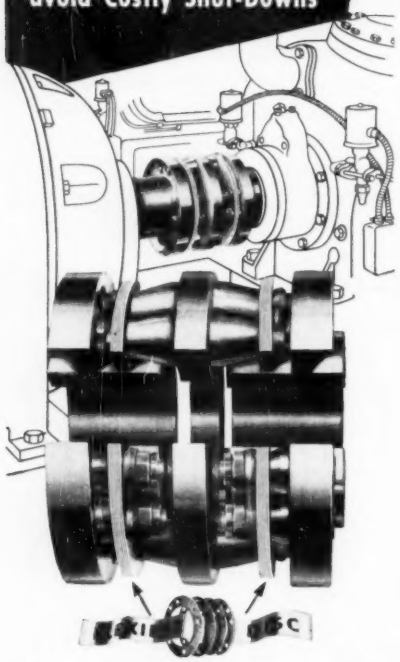
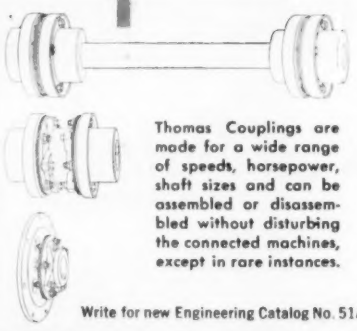
Specify THOMAS ALL METAL
FLEXIBLE COUPLINGS
for Power Transmission to avoid Costly Shut-Downs



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.

DISTINCTIVE ADVANTAGES

FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



Thomas Couplings are made for a wide range of speeds, horsepower, shaft sizes and can be assembled or disassembled without disturbing the connected machines, except in rare instances.

Write for new Engineering Catalog No. 51A

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WARREN, PENNSYLVANIA, U.S.A.

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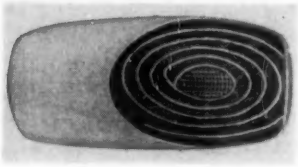


Low-Cost Filter Media

The Briggs Filtration Co., River Rd., Washington 16, D. C., has developed a new material being nationally marketed in filter cartridge form, which is made to fit in almost any commonly used filter case. Tradenamed "Hyper-Kleen", it is claimed to embody all the low cost features of cotton waste, but to differ from it in other respects.

During manufacture, cotton threads and wool fibers are treated for filtering efficiency. The wool fibers act as a helper spring so that the cotton will carry greater loads of dirt. Such serious defects as packing down, channeling, and dangerous unloading are said to be reduced to an almost negligible degree.

The company's filtration engineers have run physical, chemical, and life-performance tests, both in the laboratory and on the job, and claim that the new media will, on a dollar-for-dollar comparison, out-last and outperform ordinary cotton waste and other low priced filter media. Physically it will withstand twice the pressure of packed cotton waste and retain more dirt. Chemically the combination will not affect detergents found in any lube oil.

All-Weather Cab for Fork-Lifts

The Buda Co., Div. of Allis-Chalmers Mfg. Co., Harvey, Ill., announces it has developed an all-weather cab for Model FTPD60-24 diesel-powered fork lift trucks to permit economical all-year-round operation regardless of weather conditions.

Its features include full driver visibility, adjustable door windows for better ventilation, entry from either cab side, electric windshield wipers, and tinted plexiglass overhead window. Heater and defrosters are available as optional equipment.

Self-Tapping Set Screws

In addition to being self-tapping, the new line of set screws announced by Set Screw & Mfg. Co., Bartlett, Ill., is also self-aligning and self-locking, yet easily removable.

Cutting thread of the screw extends only around the top of slotted section and offers two cutting edges, enabling it to cut on both sides of the hole and making it possible to produce screws in the shorter lengths. The shavings, instead of accumulating below, are gathered in the slot. Due to this design, the screw is said to "pull itself in". It can be supplied with any type of set screw point.

Thread Lubricant

Crawford Fitting Co., 884 E. 140 St., Cleveland 10, Ohio, has announced a new thread lubricant for use on titanium, stainless steel, and aluminum. It comes in two grades.

Blue Goop is for up to 400°F temperatures and is said to eliminate galling so that threads may be reused many times. Silver Goop is available for temperatures up to 2100°F and is claimed to be an effective anti-seize compound for use on threaded parts of stainless steel and high temperature alloys. Both come packed in tubes.

Short-Intake Silencer

Designed for use on the intake and discharge of centrifugal blowers where length is a limiting factor, is the latest type of silencer being manufactured by Burgess-Manning Co., Libertyville, Ill. It may also be used in other applications where silencing of high frequency noise is required.

Called the ACA Series, this snubber is an absorption type. Air flow is channeled through an annular passage which is lined with transparent tubes backed up with layers of sound absorbing material. It is an outgrowth of the recently announced LCA Series and is offered as an alternative where diameter is not a problem but where length must be kept to a minimum. It will handle relatively moisture-free air up to 200°F and can be used for higher temperatures with use of special sound absorbing materials.

new products

Railroad Air Brake Hose

Aeroquip Corp., Jackson, Mich., has a new line of hose and fittings designed especially for the air brake systems of diesel locomotives. It includes applications in the air systems which provide inter-train signal communications and those which coordinate functions of two or more units working in tandem.

Several years of engineering research and intensive testing in conjunction with the Assn. of American Railroads and air brake engineers of leading railroads are said to have gone into this development of the No. 1531 air brake hose and fittings.

The new hose is of tough material with an oil resistant inner tube and containing a cover that resists the effects of sandblast and abrasion. The fittings may be salvaged and reused after removal from damaged assemblies. This feature allows on-the-spot emergency repairs by use of standard hand tools and minimum stock requirements.

Electro-Mechanical Governor

To control the speed of gasoline or diesel engine-driven generators, Inet Div. of Leach Corp., 4441 Santa Fe Ave., Los Angeles 54, Cal., has designed the DUPY, a load-sensitive electro-mechanical governor. It has two main functions: to control the frequency of an engine-driven AC alternator and regulate the voltage of a DC machine. Both functions are said to be accomplished by controlling the speed of the prime mover.

To provide for maintenance-free operation, there is only one moving part, the rotor. No hydraulic fluids, pumps, plumbing, or slip rings are used in the device. It is normally driven from the engine timing shaft through a set of spur gears which reduce speed of the rotor to 150 rpm. Adapter pads fit it to the engine type.

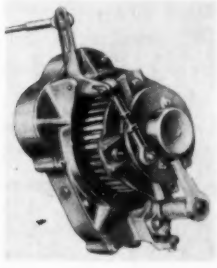


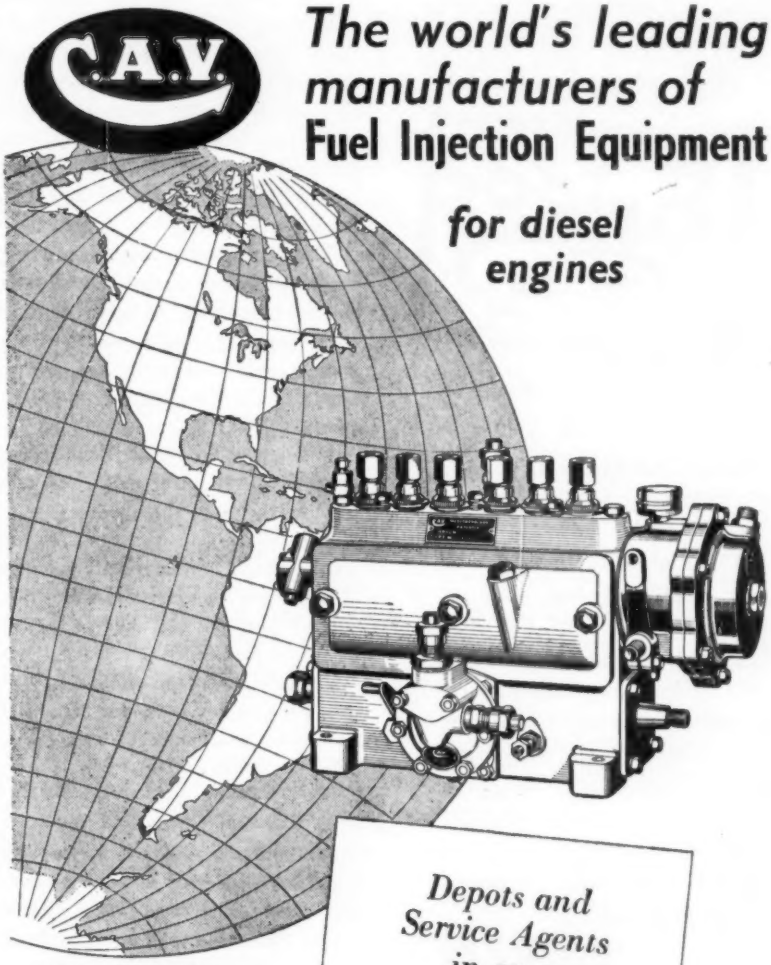
Figure Eight Cut-Off Flanges

Making available pipeline figure eight cut-off flanges in any size, carbon steel or alloy, to user's specifications, is the newest service of H. F. Butler, Inc., P. O. Box 121, Union, N. J. The service has been established to save time for companies who usually have their maintenance shops make up the flanges.

The flanges fit between flanged joints of a pipeline so that a line which is closed off infrequently can be closed or opened without need of gate valves. They are made in two sections, a disc and a ring, and joined by welding. They are machined for good gasket seating or may also be supplied for ring-type joints. That part of the flange not in use is exposed, showing whether line is open or closed.

C.A.V.

The world's leading manufacturers of Fuel Injection Equipment for diesel engines



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new products

Multi-Purpose Charger-Tester

Fox Products Co., 4720 N. 18 St., Philadelphia 41, Pa., has added a combination battery charger and tester to its line. The charging component combines four chargers in one.

Setting the fast-slow switch makes it a complete fast charger or a complete slow charger. Setting the 6- to 12-v switch makes it a complete 6-v charger or a complete 12-v charger.

The charger has six adjustable fast charge rates (three for 6-v and three for 12-v batteries) for quick charges and boost starts. As a slow charger, it handles up to six 6-v or three 12-v batteries or various combinations, and six adjustable slow charge rates (three for 6-v and three for 12-v batteries).

The testing component provides three different tests: percent of charge in battery, battery condition under open circuit conditions and under load, and generator system condition under actual operating conditions.

The units are made with either electric time control or safety control. In the first, the timer is set at any interval up to one hour for fast charging and automatically cuts off at the end of this interval. The safety control permits the charger to put in all the fast charge the battery can safely take, and then shuts off. With this, an operator need not know battery condition, state of charge, or other variables.

Pipe Cut-Off Machine

Production cutting of up to 1000 pieces of pipe per hour is claimed for a new bench-type pipe and tube cut-off machine manufactured by Continental Machine Co., 1952 N. Maud Ave., Chicago 14, Ill.

The machine cuts sizes from ⅜-in to 1¼-in OD pipe and tubes from light gauge to 12-gauge wall thicknesses. Drive is by a ¼-hp gear-headed motor which connects to a 115-v AC outlet. The cutting wheel is 7-in diam. An adjustable depth regulator limits downward cutting stroke.

new literature

Lubrication Engineering

The American Soc. of Lubrication Engineers announces that the proceedings of its first national symposium has come off the press. The publication, "Fundamentals of Friction and Lubrication in Engineering", contains 12 papers by experts in their fields and published for the first time. The papers include complete bibliographies and over 300 references. The book is available at $3.50 from the society, 84 E. Randolph St., Chicago 1, Ill.

Solenoid Valves

Availability of a 4-page bulletin covering design and performance characteristics of its line of DO (diaphragm operated) solenoid valves, has been announced by Eclipse Fuel Engineering Co., 1012 Buchanan St., Rockford, Ill.

Cross-section views show open and closed positions of the two moving parts of the valves: solenoid plunger and diaphragm. Specifications cover valve use in control and cycling operations. Also included are electrical characteristics and materials of construction, pressure ranges, and pipe sizes.

Packing Selector

The right packing information for almost any application is obtainable in a matter of seconds with a simplified packing selector being made available by the N. Y. Belting & Packing Co., subsidiary of U. S. Rubber Co., 1 Market St., Passaic, N. J.

Shown on the free circular selector are packing styles and pressure and temperature readings for four types of packing applications—gaskets, valve stems, and centrifugal and reciprocating pumps. Material handled—steam, water, petroleum, natural gas, etc.—is printed alongside a window in a small disc which mounted on a large one. Reverse side of the wheel gives sizes in which the recommended packing is available. It may be obtained by request on company letterhead.

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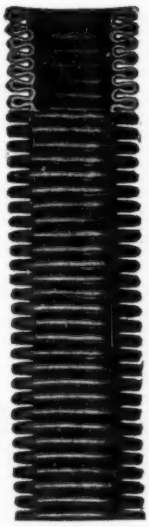

Diesel Bulletins 1020 & 50A furnish complete information.

See our Catalogs in Sweet's Files for Product Designers and Mechanical Industries.

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new literature

Product Development Materials

The problems facing product designers in their selection of materials are discussed in "Material for Product Development—1954", which has been published by Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y. Second of a series, the book contains proceeding of the Basic Materials Conference held in Chicago last May.

Six basic problems are discussed: future materials; new metal forming processes such as precision casting, powder metallurgy, forging, extrusion, and stamping; non-metallic materials; joining, emphasizing adhesive bonding of metals and plastics; corrosion protection; and, material management.

In addition to the text of 13 papers presented, the book contains 27 illustrations, tables, and diagrams. A highlight is inclusion of 258 questions and answers presented at the meetings. The book is sent without charge to all who attended the conference; others may purchase it for $7.50.

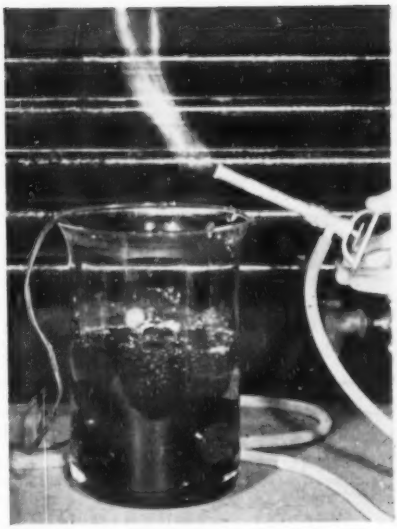
Natural Gas Engines

Le Roi Div. of Westinghouse Air Brake Co., 1706 S. 68 St., Milwaukee 14, Wis., has issued an 8-page bulletin describing and illustrating its 225 to 675 hp, L3460 and L4000 natural gas engines.

Cutaway views and studio photos are used to show design features. Charts give horsepower ratings at varying rpm's with LPG, gasoline, or natural gas fuel. Application photos detail various industrial installations. Basic specifications are also included.

"Alumi-Coat" Brochure

Arthur Tickle Engineering Works, Inc., 21 Delavan St., Brooklyn 31, N. Y., is offering a brochure describing the "Alumi-coat" process of bonding aluminum and its alloys to ferrous metals. (A discussion of this process is contained in a major article in this issue of DIESEL POWER.)



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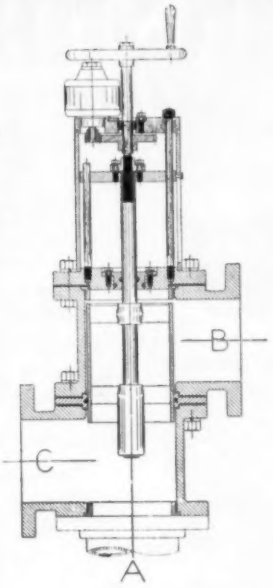

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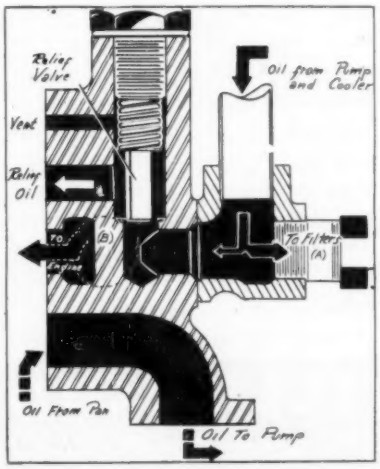
service section

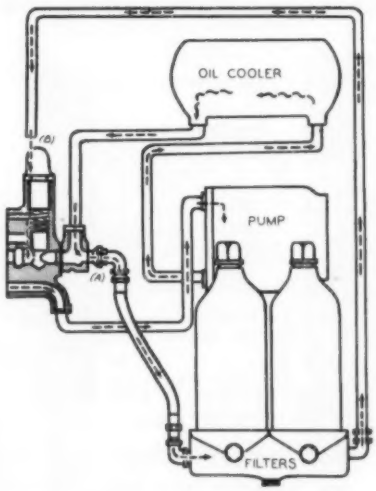
(*Continued from page 53*)

without filters, a jumper line of the same size as filter supply line must be installed between the relief valve body outlet connection (A) to the filter, and the relief valve inlet connection (B) from the filter. This is not a good procedure as any dirt in the oil will be fed directly to the engine bearings.

4. Note that oil from pump and cooler is conducted to a chamber on the side of the relief valve body where part is permitted to pass the relief valve to the oil pan and part is directed to the filters and thence to the engine. This means that excess oil volume from the oil pump is relieved rather than forced through the filters. Thus, if filter elements are allowed to clog due to neglect, engine must depend entirely on oil passing the built-in filter relief valves in the filter body. If further neglect, abuse, or gumming sticks the filter relief



valves, most of the pump output would then bypass through the main



engine relief valve and engine failure would probably result. Condition can obviously be prevented by regular filter changes and periodic checking of filter bypass valves and passages through the clean-out plugs provided.

5. Correct filter replacement elements are Winslow No. 1656-0, Waukesha part No. 119764.

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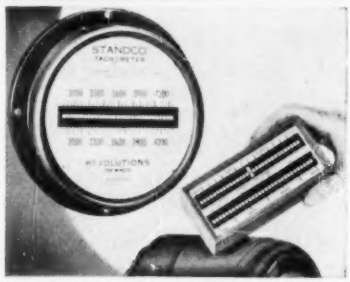

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new literature

Hose for Diesel Installations

The American Metal Hose Branch, The American Brass Co., Waterbury 20, Conn., has produced a brochure on its flexible metal hose assemblies for the diesel field, both stationary and marine. Three types are fabricated: steel corrugated exhaust and air intake, steel interlocked exhaust and air intake, and seamless corrugated hose covered with wire braiding for conveying air, fuel oil, lubricating oil and water.

Each type is illustrated with application photos. Types of fittings, engineering data, ordering information, and installation recommendations are included in the bulletin.

Automotive Fasteners

The Wheel Parts and Mfg. Co., Inc., 352 Fourth Ave., New York 20, N. Y., has issued a catalog covering its complete line of fasteners for the automotive trade. Described and illustrated are all sizes of hex cap screws, hex nuts, castellated nuts, round head stove bolts and nuts, cotter pins, and spring lockwashers. Also listed are utility assortments of cotter pins, lockwashers, and stove bolts.

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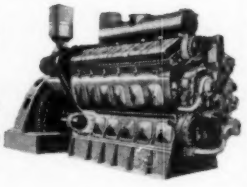

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What Do You Know!

(*Answers to Questions on Page 44*)

1. Actually all three are correct, but "c" is most correct from a functional point of view. For example, governor adjustments would be senseless until the injection system had been checked. See Page 45 for a typical step-by-step tune-up.

2. Correct answer is "b". It is necessary to balance the two pump units as each supplies fuel to half of the cylinders through separate distributor blocks. See article mentioned above for procedures.

3. "b" is correct answer. The gasoline starting system was not intended for prolonged operation. For one thing, the valves connecting the main and auxiliary chamber are off their seats and are not being cooled. Warpage may occur. See article mentioned above for proper operation.

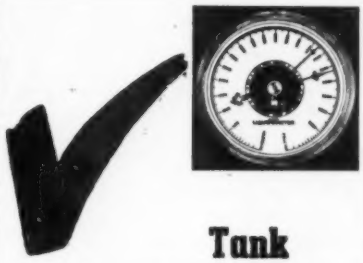
4. Correct answers are "b" and "c". Normally the hydraulic lifters will go from engine overhaul to overhaul without requiring special attention. First indication of trouble, say from gumming by oil oxidation products, is noise. See article on Page 36 for detailed discussion.

5. Correct answer is "b". Oil oxidation products may form beyond normal limits of plunger travel and when change in actuating mechanism increases travel, cleaning may be necessary. See article above.

6. "b" and "c" are correct. The pH is a yardstick of relative acidity or alkalinity. It is an important factor in corrosion of cooling system materials. See Page 42.

7. "b" is correct answer. Rusting or oxidation will still occur and protection is still needed. See article mentioned above.

8. Correct answer is "a". Tests have shown a common type to be non-abrasive as well as effective fire protection. See article on Page 32.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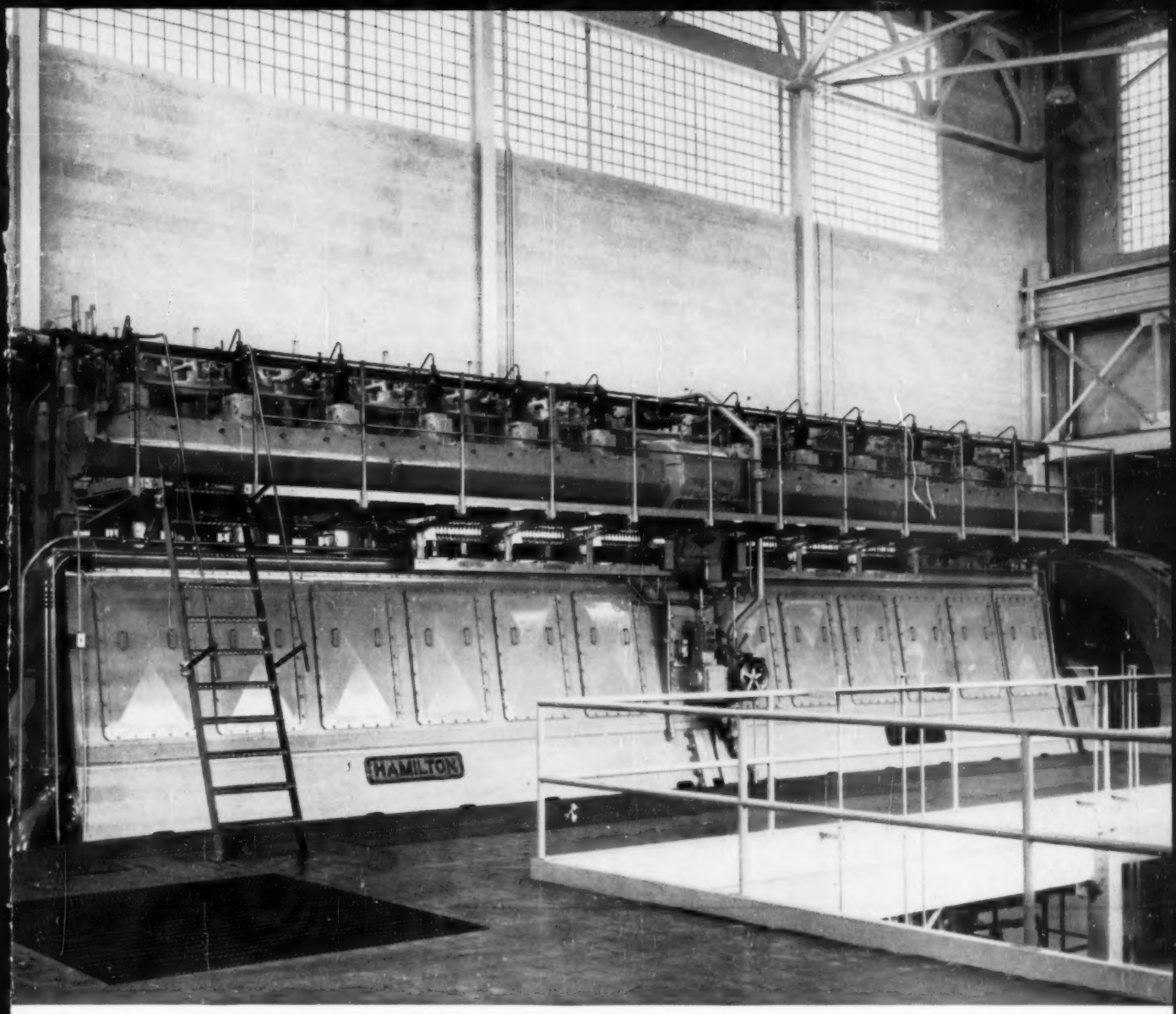
Young Radiator Co. 16

Zollner Machine Works ..... ***



L. C. Pettibone, Supt., Electric Light & Power Dept., Decatur, Indiana, reports:

"Our Hamilton diesel burns heaviest residuals with invisible exhaust...for just 4.6 mills per kwh"

"This 3810 kw Hamilton 21½ x 27½ engine is operating 18 to 20 hours per day, burning very heavy fuel (no. 6) *with an absolutely invisible exhaust.* We have experienced *no unusual piston ring or liner wear.*

"This engine provides for the turbulence at time of fuel injection and considerably more air in the cylinder. That is why we can burn the very heaviest fuels on the market today . . . for just 4.6 mills per kwh.

"We extend a cordial invitation to any Diesel engine operators to visit our Decatur plant and see our complete fuel handling system and this Diesel generating unit," Mr. Pettibone concludes.

Hamilton Division, Hamilton, Ohio

BALDWIN-LIMA-HAMILTON

STANDARD HD
TRADE MARK
OIL

keeps rings FREE
(and cuts down wear!)

Bancroft Superintendent, Verne Austin (left) consults with Standard Oil lubrication specialist R. R. Spargo, (right) on periodic check-up to see that STANDARD HD is still in like-new condition.

Here's what Verne Austin, superintendent of the Municipal Light Plant, Bancroft, Iowa, writes about the effectiveness of STANDARD HD Oil: "Before switching to STANDARD HD Oil, we were troubled with ring-sticking, dirty crankcases, excessive port carbon, frequent cleaning and stack fires. Since switching to STANDARD HD Oil, ring sticking is at an absolute minimum, crankcases are *always* clean, port carbon is almost nil, stack fires are practically eliminated!"

Since this plant switched to STANDARD HD Oil, they have also had the help and advice of an experienced Standard Oil lubrication specialist. He has made regular, periodic calls to check the oil and to make sure it's still in like-new condition.

STANDARD HD Oil lubricates better because it cuts down wear . . . keeps vital parts clean. If you have any lubricating problems, call your nearby Standard Oil office. Or write to Standard Oil Company, 910 S. Michigan, Chicago.

STANDARD OIL COMPANY

STANDARD (Indiana)